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A STUDY OF THE CRYSTALLINE SILICEOUS MINERALS PRESENT IN SILICOTIC LUNGS BY THE X-RAY DIFFRACTION METHOD

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THIS paper reports the results of an x-ray diffraction pattern study of the crystalline siliceous material present in the lungs of 35 men exposed to dusts containing free and/or combined silica. This series was selected to include as many different mining and industrial exposures as possible, and the 35 cases examined were divided arbitrarily into five groups. Only 20 cases have been reported, and the individual cases in each group were chosen for the purpose of showing the maximum variations which occur in the x-ray diffraction patterns of the siliceous portion of the lung ashes of workmen having similar types of mining or industrial exposures. The number presented in each group in no way indicates the incidence of silicosis in any particular mining area or industrial occupation. At the beginning of the experiment it was anticipated that the films obtained would be characteristic for each type of exposure. The data presented in this paper tend to show that in most of the 35 cases very little information concerning the dust exposure can be gained from the appearance of the x-ray diffraction pattern.

The x-ray diffraction method is limited to the estimation of the relative proportions of the different siliceous minerals present and gives no indication of the total amount of siliceous material which may be present in a lung. On

the other hand, in dealing with atmospheric dusts information concerning the percentage composition of the siliceous material is a great aid in evaluating the severity of the exposure.

Some of the lungs exhibited marked silicosis, while others presented moderate or early types of this disease. In many cases the primary cause of death was not attributable to the dust exposure, and this probably accounts for the high proportion of cases which showed no evidence of active tuberculous infection.

EXPERIMENTAL DETAILS

(a) *Production of the x-ray diffraction patterns.*—If a beam of x-rays of a single wave length is photographed only a spot will be recorded on a film. However, if finely divided or minute crystals of a mineral are placed in the path of the beam most of the rays will pass through without deviation, but some of the rays will be diffracted and, when photographed, these diffracted rays will produce on a film a pattern consisting of a series of concentric rings which depend upon the arrangement of the molecules within a crystal. Each mineral gives a relatively simple but characteristic pattern consisting of rings of unequal intensities. These rings are shown diagrammatically in Fig. 1. With

mixtures more complex patterns are produced, depending upon the number of different minerals present, and the relative intensities of the individual patterns are proportional to the quantities of the substances present in a mixture. In

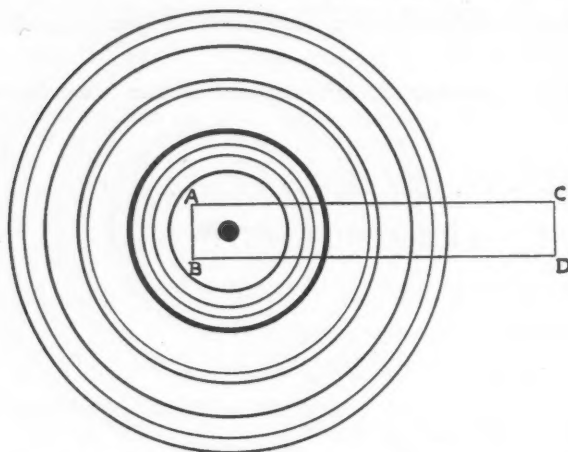


Fig. 1.—Diagrammatic representation of a cross section of the concentric rings produced by the passage of a beam of monochromatic x-rays through finely divided crystalline material.

practice all of the diffracted rays are not photographed in their entirety but one small area is reproduced as shown in rectangle a, b, c, d. Thus just a small section of each ring appears on a film. In this paper the prints of the films have been trimmed to a size suitable for reproduction.

The x-ray diffraction patterns were obtained by the method described by Walker, Clark and Reynolds.^{1,2} The x-rays were produced by a Muller Line-Focus Metalix tube with a copper anode to which was applied an unrectified electromotive force of 40 K.V. peak. The current through the tube was 20 milliamperes. The beam of x-rays was made approximately homogeneous (1.54 Å U) by a filter of nickel foil 0.01 mm. thick. Its intensity was such that the diffraction patterns of the dusts could be photographically recorded in two hours. Two diffraction cameras of the Debye-Scherrer type were used. Each was 6.5 cm. in radius and the x-ray beam was defined by two pin holes, 0.75 mm. in diameter, 7 cm. apart. The dust sample was pressed into a small block and supported at the centre of the camera in such a position that the x-ray beam fell on one face at an angle of 18 degrees, at which setting the main bands of the minerals present were sharply defined. The top of the beam just grazed the upper edge of this face.

The sample was made to oscillate with uniform velocity at a frequency of about twenty-five oscillations per minute, through 2½ degrees to each side of the 18 degree position in order that the irregularities in the diffraction pattern caused by larger fragments in the sample might be smoothed out. The cameras were made light-tight so that it was not necessary to cover the inner surface of the photographic film with opaque paper. This eliminated irregularities due to the non-uniform absorption of the x-rays by the paper and reduced the necessary exposure time by one-third. Dupont x-ray film was used and was developed in a dilute glycin developer which was found to give satisfactory contrast and detail in the films.

(b) *Standard minerals.*—A survey of the occupations of the persons who were studied suggested that one or more of the following eleven minerals would possibly be present in the lungs in detectable amounts, namely, muscovite, kaolin, quartz, microcline, orthoclase, albite, oligoclase, talc, tourmaline, chlorite and tremolite. Samples of the above minerals were obtained in as pure form as possible through the kindness of the Department of Mineralogy, University of Toronto, and the Ontario and Dominion Departments of Mining. These minerals were ground in petroleum ether in a small ball mill constructed of case hardened tool steel. The ground samples of the materials used for the diffraction patterns were powders having a particle size of less than 5 microns.

(c) *Mine dusts and tamping powders.*—A number of samples of underground aerial dusts were procured from the following Ontario mining areas: Kirkland Lake, Porcupine and Sudbury. The material was obtained by means of a household vacuum cleaner fitted with a fine exhaust bag, and, to obtain sufficient quantities, from 2 to 6 weeks were necessary for the collection of each sample. Similar x-ray diffraction patterns were obtained from each of the samples procured from the same district, and for this reason only three prints were reproduced for publication—one from each of the three areas mentioned above. Tamping powders used in these mining areas were included in this study, as it was thought that their mineral constituents might be present in some of the lung ashes under investigation.

(d) *Preparation of the lung ashes.*—The dry weight was obtained by heating a representative portion of the lung to constant weight in an oven at 110° C. Most of the ashes were prepared in the following manner. The lung was well washed with water to remove as much of the formalin as possible and then transferred to one or more two-litre beakers, depending on the amount of tissue used. Concentrated nitric acid was added to the depth of about half an inch. The initial action was very vigorous. Additional quantities of concentrated nitric acid were added at intervals as needed and the lung allowed to slime at room temperature for about two weeks. When the sliming was complete the acid solution was diluted with an equal volume of distilled water and filtered through Whatman No. 54 filter papers. The residue was washed with distilled water until free of acid.

The residue was removed from the filter paper, transferred to platinum dishes, and evaporated to dryness. Then the platinum dishes and contents were gently heated to remove the organic material. The final incineration was done in a muffle furnace at dull red heat. This crude acid-insoluble fraction was transferred to a centrifuge tube and treated with 50 per cent nitric acid. The tube and contents were placed

in a beaker of hot water for ten or fifteen minutes and stirred frequently. After cooling the mixture was centrifuged and the supernatant liquid was decanted off and added to the original filtrate. The process was repeated several times with 50 per cent hydrochloric acid and finally with distilled water. The residue, consisting mainly of silica and silicates, was washed into a platinum dish, evaporated to dryness, cooled and weighed.

Three of the lungs, namely 1335, 1384 and 1552, were not digested in nitric acid but were incinerated directly. The ash was treated as above with 50 per cent nitric acid, and then with 50 per cent hydrochloric acid in order to remove the soluble fraction. The total silica content of the acid-insoluble part of each lung ash was determined by fusing the ash with sodium carbonate, dehydrating the silica with hydrochloric acid and volatilizing with hydro-

fluoric acid. It was found that satisfactory x-ray diffraction patterns could be obtained without grinding the lung ashes in a ball mill, as they already existed in a finely divided state.

FINDINGS

(a) *Standards.*—The x-ray diffraction patterns of the minerals chosen as standards are shown in Fig. 2. As the patterns given by the mica group of minerals which were investigated (phlogopite, sericite, and muscovite) were essentially the same, only one print from this group is presented. For the same reason, only one picture each is given for the potash feldspars (microcline and orthoclase) and for the soda feldspars (albite and oligoclase). Inspection of Fig. 2 shows that the pattern for each mineral is composed of a series of bands of varying intensities. The strong or primary bands occur at different distances from the centre of the pattern, and are usually those chosen for the identification of the individual minerals. In the series of standards which were used these primary bands show no interference with each other except in the case of quartz and the mica group. In this case it is necessary to use a weaker or secondary band for the identification of the mica group. These secondary bands are easily seen

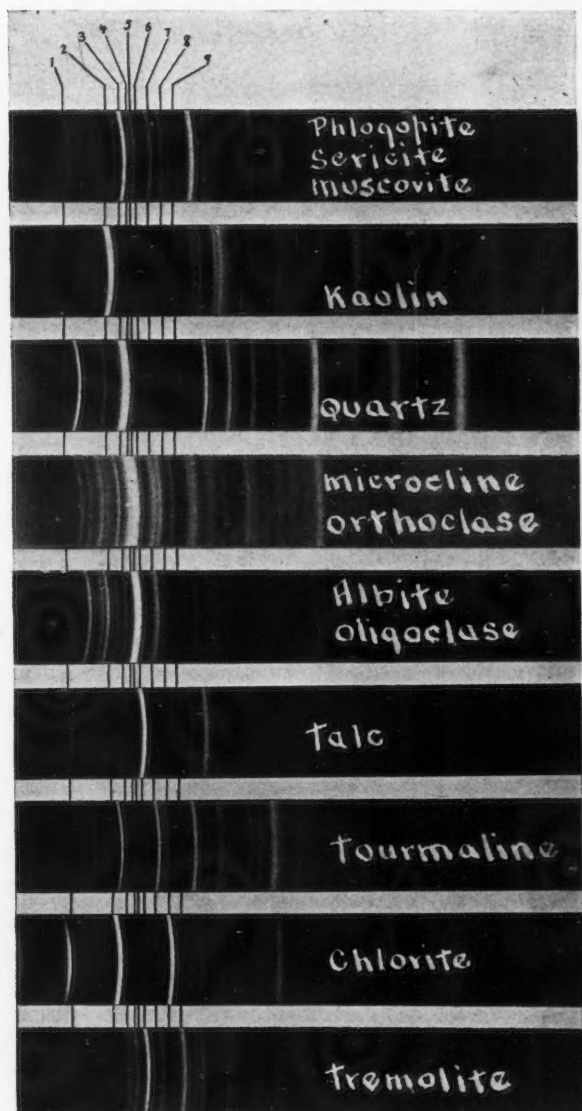


Fig. 2.—X-ray diffraction patterns of pure minerals commonly present in industrial and mine aerial dust.

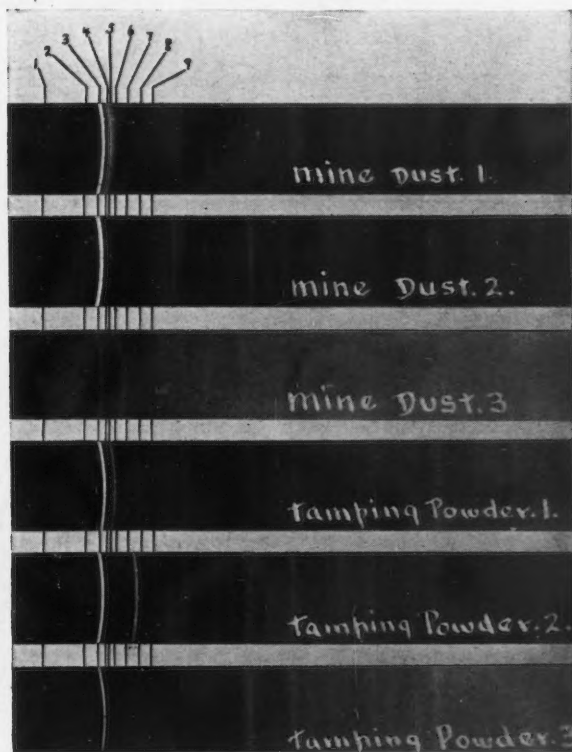


Fig. 3.—X-ray diffraction patterns of aerial mine dusts and tamping powders.

Fig. 4

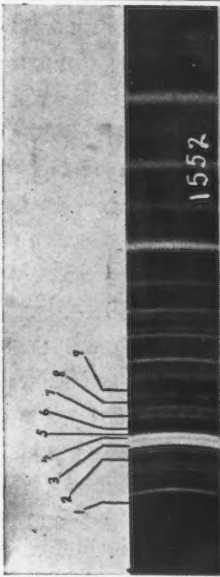
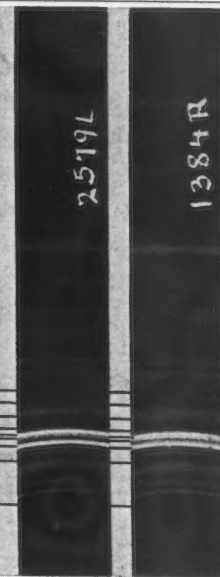
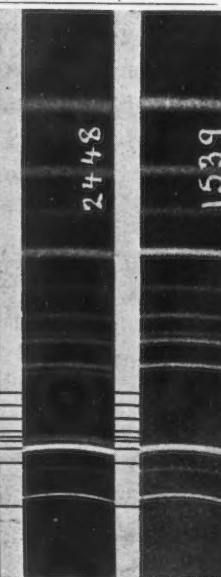
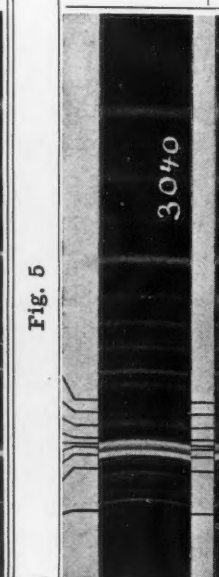
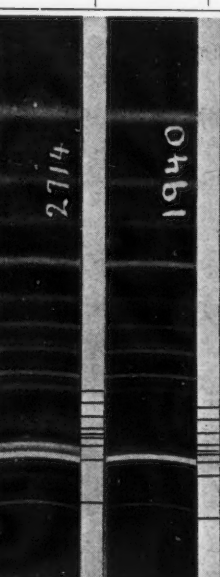
Age at death	INDUSTRIAL EXPOSURE	Interval in months between last exposure and death	Post-mortem lung findings	X-ray diffraction patterns of acid-insoluble fraction of lung ashes	Mg. total SiO_2 per 100 g. lung dry weight	Minerals present
55	17 years brick-maker, England 14 years flint clay feldspar	1	Silicosis No tuberculosis		2110	Quartz +++ Potash feldspar ++
60	4 years granite cutting, Scotland 6 years granite cutting, England 20 years granite cutting, Ontario	60	Silicosis Tuberculosis		5380	Soda feldspar +++ Quartz ++ Potash feldspar trace
55	10 years granite cutting, Scotland 20 years granite cutting, Ontario	19	Silicosis Tuberculosis		7890	Potash feldspar +++ Quartz ++
45	12 years enameller quartz and feldspar	23	Silicosis Tuberculosis		4670	Quartz +++ Potash feldspar trace
42	6 years sand blaster	8	Silicosis No tuberculosis		1310	Quartz +++

Fig. 5

PORCUPINE EXPOSURE

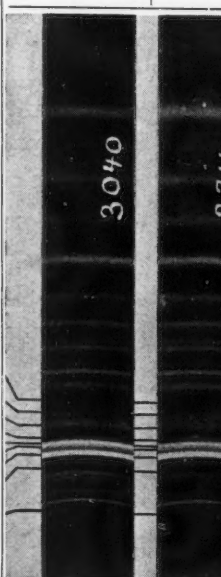
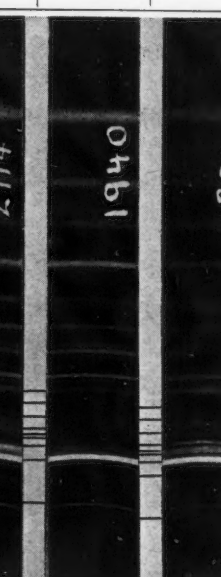

Age	Exposure	Interval in months between last exposure and death	Post-mortem lung findings	X-ray diffraction patterns of acid-insoluble fraction of lung ashes	Mg. total SiO_2 per 100 g. lung dry weight	Minerals present
41	14 years	39	Early silicosis No tuberculosis		1000	Quartz ++ Soda feldspar ++ Mica +
53	13 years	1	Silicosis Tuberculosis		1100	Quartz ++ Soda feldspar ++ Potash feldspar trace Mica + Talc trace
39	10 years	81	Silicosis Tuberculosis		940	Quartz +++ Mica ++ Potash feldspar trace
55	6 years (in mill)	1	No silicosis No tuberculosis		90	Quartz ++ Potash feldspar trace Soda feldspar trace Mica + Talc trace

Fig. 6

MIXED MINING EXPOSURE

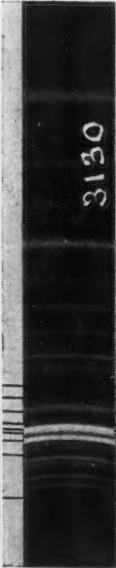
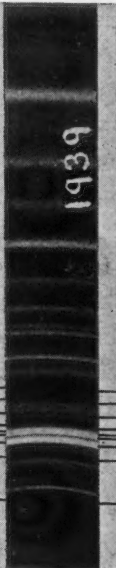

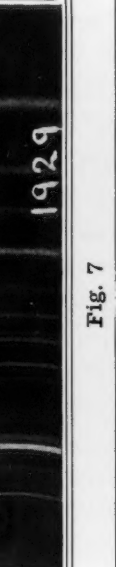
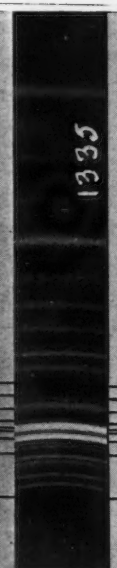
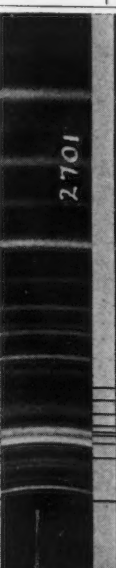





45	1 year tin mine, England 2 years Sudbury 9 years Porcupine	88	Early silicosis No tuberculosis		450	Soda feldspar+++ Quartz++
58	7 years Sudbury 7 years Porcupine	67	Early silicosis No tuberculosis		1470	Quartz+++ Potash feldspar+ Mica+
48	1 year Pyrite mine 1 year Sudbury 12 years Porcupine	7	Early silicosis No tuberculosis		3120	Quartz+++ Potash feldspar trace Soda feldspar trace Mica+ Tremolite tr.
40	3 years Cobalt 12 years Porcupine	84	Marked silicosis Tuberculosis		520	Quartz+++ Mica++ Potash feldspar trace

Fig. 7

MIXED MINING EXPOSURE

66	1 year Kirkland Lake 18 years Cobalt	78	Marked silicosis Tuberculosis		1780	Quartz++ Soda feldspar++ Mica+
52	6 years Kenora	42	Silicosis Tuberculosis		680	Quartz++ Potash feldspar++ Talc trace
57	3 years gold mine B.C. 8 years Cobalt 8 years Kirkland Lake	75	Early silicosis No tuberculosis		4210	Quartz+++ Mica+ Potash feldspar trace
50	3 years gold mine Nova Scotia 14 years Kirkland Lake	66	Silicosis Tuberculosis		2620	Quartz++ Mica++ Soda feldspar+ Talc trace
43	5 years Sudbury (rock house)	18	No silicosis Tuberculosis		210	Soda feldspar+++ Quartz++ Talc trace
57	18 years coal mine, Scotland 3 years Cobalt 5 years Kirkland Lake	3	Early silicosis Tuberculosis		3080	Soda feldspar+++ Quartz++ Mica trace
57	18 years pyrite 1 year feldspar 2 years gold	34	Silicosis Tuberculosis		2440	Quartz++ Mica++ Albite+

in the films, but when printed they often fail to reproduce in their original intensities. For each of the nine standards one characteristic band was chosen for purposes of identification. The position of these bands is shown by the nine vertical lines drawn in Fig. 2. Thus line No. 1 is used for the detection of the mica group (phlogopite, sericite and muscovite), No. 2 kaolin, No. 3 quartz, No. 4 potash feldspars (microcline and orthoclase), No. 5 soda feldspars (albite and oligoclase), No. 6 talc, No. 7 tourmaline, No. 8 chlorite, and No. 9 tremolite. These lines are used to identify the respective minerals in the aerial mine dusts, tamping powders and lung ashes.

(b) *Mine dusts and tamping powders.*—The films obtained from the samples of underground mine dusts and the tamping powders are shown in Fig. 3. The mine dusts and tamping powders which came from the Kirkland Lake, Porcupine, and Sudbury areas are numbered 1, 2 and 3 respectively. The mine dust from the Kirkland Lake area consists of quartz, potash feldspar and mica, while the mine dust from the Porcupine area contains quartz and mica with a small amount of soda feldspar. It was very difficult to obtain a satisfactory film from the Sudbury mine dust and in the one reproduced only quartz is detectable. The three tamping powders contain quartz as one of the principal constituents, while soda feldspar is also present in considerable amounts in Nos. 1 and 3.

(c) *Lung ashes.*—In the 35 cases which were studied the following minerals were shown to be present in one or more of the lung ashes—quartz, mica, soda and potash feldspar, talc and tremolite. From an inspection of Figs. 4 to 7 it is evident that the most prominent pattern in each print is that presented by quartz. This indicates that quartz is present as a chief constituent of all the lung ashes. In the majority of cases either one or both of the mica and soda feldspar groups were present in important quantities. Only a small amount of potash feldspar was demonstrable in a few of the lung ashes, while talc and tremolite, when present, occurred only in traces. All of the bands in the x-ray diffraction patterns of the lung ashes were identified with the exception of four faint ones which indicated the presence of four additional minerals. In only four of the cases reported (1801, 1658, 2579, and 2448) was there any

evidence to suggest the presence of one or more of these extra minerals. No attempt was made at identification as it was realized that they were only present in very small amounts.

DISCUSSION

It is only recently that the x-ray diffraction method of analysis has been adopted for the determination of the minerals present in industrial dusts and in lung tissue. Recent work along these lines has been published by the following. Walker and Clark and Reynolds^{1, 2} quantitatively determined the amount of quartz present in several Ontario underground aerial mine dusts. In a preliminary report, Bale and Fray³ published data which indicated the presence of quartz in two industrial dusts. Sundius, Bygden and Bruce⁴ showed the similarity which existed between the x-ray diffraction patterns produced by the lung ash of an earthenware worker and the factory dust to which he was exposed. Hicks and his co-workers^{5, 6} reported that they were able to detect the presence of quartz in individual dusts and in some of the lungs of non silicotics. Klaas, Sweany, Mrgudich and Clark⁷ showed the presence of quartz in the lung tissue of two silicotics.

In this study the lung ashes were treated with acids to remove all the acid-soluble material, and in this way a fraction was obtained which consisted practically entirely of silica and silicates. Although this acid treatment dissolved a small amount of siliceous material, yet the advantages derived by using a siliceous fraction of maximum purity instead of the complete lung ash or the dried lung tissue far outweighed this possible objection. The intensity of the bands produced in the x-ray diffraction patterns is greatly increased, thereby facilitating the identification of the individual constituents. Further, these patterns were not further complicated by the presence of any crystalline non-siliceous substances. The standards, which underwent the same acid treatment, exhibited no change in their x-ray diffraction patterns. It was thought that the siliceous fraction of the lung ash might have undergone some alteration when heated to dull red heat during the process of purification. To test this point, samples of both quartz and sericite were subjected to the same temperature as the lung ashes. No change was apparent in the x-ray diffraction pattern of the quartz, but with sericite, although the total number of bands re-

mained the same, some of the bands showed a slight alteration in their relative intensities.

The x-ray diffraction technique possesses some distinct advantages over the other methods of assay. Only small amounts of material are necessary, and the method can be used for the identification of crystals of only a fraction of a micron in size. In fact, the theoretical lower limit is given by the wave length of the type of x-rays used (1.54 Å U). Petrographic methods, being limited by the wave length of the light used (sodium light 5890 Å U) cannot be employed for the identification of very minute crystals. Further, the photographic film records the pattern of each crystalline substance present in a mixture and thus affords a direct means of identification. This is not possible by either chemical or spectrographic analysis, as only the relative amounts of the elements are determined and not the different constituents. However, certain disadvantages of the x-ray diffraction method are apparent. It cannot be used to determine amorphous material nor to differentiate between crystalline substances having the same internal molecular structure. A further difficulty arises when the primary bands of two or more crystalline substances are superimposed upon each other. When this occurs it becomes necessary to use the weaker secondary bands for purposes of identification. Also when a mixture is analyzed, the patterns given by substances present only in traces may be obscured by those given by the chief constituents.

The data relating to each case appear beside the respective prints in Figs. 4 to 7. Some of these details may be incomplete, as it is often very difficult to obtain accurate information concerning a history of dust exposure. An inspection of the prints show that in all cases except 1539 the lung ashes consist of a mixture of minerals, and it is apparent that quartz is one of the chief constituents in each case. Although the evidence presented in this paper is essentially qualitative in nature, some attempt has been made to give quantitative information concerning the relative amounts of the different minerals in the lung ashes. These quantities are recorded in the last column and are based upon the relative intensity of the band chosen as being characteristic of each mineral.

From an inspection of Figs. 4 to 7 it is evident that no definite correlation has been found between the x-ray diffraction patterns and the

occupational histories. These differences might be partially explained by the fact that different dust exposures exist in the same mine or industry and they depend upon the type of work done by the individual. Also the presence of tuberculous infection in the lung apparently does not produce any detectable modification in the relative proportions of the different siliceous minerals present in the lung. Further, no correlation seems to exist between the patterns and the age, the length of the interval between last exposure and the termination of the case, or the total silica content of the lungs.

SUMMARY

1. The siliceous fraction of 35 lung ashes of persons exposed to various types of siliceous dusts were studied by the x-ray diffraction method. In each case a film was obtained which permitted the identification of the chief minerals present. Twenty of these cases are presented in this paper.

2. It has been shown that quartz is present as a chief constituent in all the lung ashes examined. In the majority of cases either one or both of the mica group (muscovite, phlogopite and sericite) and the soda feldspar group (albite and oligoclase) were present in important quantities. Only small amounts of the potash feldspar group (orthoclase and microcline) were demonstrable in a few of the ashes. Talc and tremolite, when present, occurred only in traces.

3. No definite correlation could be demonstrated between the crystalline siliceous material of the lung ash and the occupational history of the individual by the use of the x-ray diffraction method of analysis.

The authors wish to express their appreciation to the Technical Silicosis Committee of the Ontario Mining Association for their financial assistance which has made this investigation possible.

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IMPORTANT MINOR POINTS IN LOCAL ANÆSTHESIA*

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SUCCESS and failure in local anæsthesia often depend on several seemingly unimportant factors which are frequently overlooked. An otherwise excellently administered block may fail to produce satisfactory results if one or more of these are neglected.

PRELIMINARY MEDICATION

As a foundation on which to start, the patient should be effectively narcotized. Regional and local blocks do not always completely abolish pain impulses, and the injection of the solution itself is likely to be painful. For these reasons morphine or some other dependable *pain-relieving* drug should be given in doses that are rather liberal as compared with those ordinarily used before spinal, ether, or cyclopropane anæsthesia. On the other hand the doses of drugs used to *allay apprehension*, such as scopolamine and the barbiturates, should be small, for example 0.2 mg. (1/300 gr.) of scopolamine with 0.1 gm. (1½ gr.) of pentobarbital sodium (nembutal) for a middle-aged adult of good vigour. If larger doses of either of the latter drugs are used the patient is likely to be disoriented, and if pain impulses are not completely blocked he may become delirious and uncontrollable. Since the barbiturates also protect against the *convulsive effect* of the intravenous injection of local anæsthetics they should never be omitted.

If the metabolic rate is high it may be expected that responsiveness to pain stimuli will be correspondingly exaggerated. Therefore the doses of all of these drugs should be increased above the average for the youthful patient, for the unusually muscular or vigorous, and for those afflicted with fear, with fever, or with thyroid toxicity. On the other hand they should be decreased if the metabolic rate and reflex activity are low. This occurs in infancy and old age, and in the presence of anæmia, myxœdema, prolonged invalidism, or weakness from any cause. The same principles of altering

doses apply to all narcotics and anæsthetics under all circumstances of administration.

DRUGS

Procaine (novocaine, neocaine, etc.) has earned its popularity through many years of satisfactory use. *Metycaine* has been used in several hundred cases at the Lahey Clinic, and thus far seems to be superior to procaine; anæsthesia appears to develop more rapidly and surely, to be more intense, and to last longer. Furthermore, its toxicity clinically appears to be no greater than that of procaine. It may be used in the same strengths and amounts as procaine, but it is probable that weaker solutions could be used.

SOLUTIONS

Half per cent and occasionally 1 per cent solutions of either procaine or metycaine are used for local infiltration and for field blocks, and 1 and 2 per cent solutions for nerve blocks. The solvent should be physiological saline, to avoid the pain produced by a hypotonic vehicle such as distilled water. The solution should be warmed to body temperature, because, if cold, anæsthesia will be slow in developing, and, if too hot, anæsthesia is likely to be brief and toxic effects are likely to occur. The anæsthetist will usually have to depend on attendants to give him the saline, but he should add the anæsthetic and vasoconstrictor drugs himself, taking them from manufacturers' labeled ampoules or from some other reliable source. When this rule has not been followed I have observed a nurse pouring epinephrine solution from a bottle into a solution of procaine instead of carefully measuring it, and I have known surgeons who have asked for procaine solution to receive 20 per cent solution of procaine, 30 per cent solution of sodium chloride, or even 95 per cent alcohol. The pain of the alcohol injection was severe, and the strong solutions of procaine and of sodium chloride caused serious sloughs. It is probable that a considerable portion of so-called procaine fatalities have really been from cocaine unwittingly given.

* A paper read at the Sixty-eighth Annual Meeting of the Canadian Medical Association, Section of Surgery, Ottawa, June 23, 1937.

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TOXICITY

Most texts fail to differentiate between the toxic effects of the local anæsthetic on the one hand and of the vasoconstrictor drug on the other. The profession is indebted largely to Lundy for drawing attention to the distinction. The *gradual absorption* of the local anæsthetic from the tissues causes a drop in blood pressure, also pallor and sweating, and in more severe cases nausea, vomiting and respiratory depression. The condition should be treated by giving a vasoconstrictor drug and oxygen. The development of such toxicity is dependent on rapid absorption of the drug into the circulation. The speed of absorption, and therefore the likelihood of the occurrence of toxic effects, is greater with larger amounts of the anæsthetic drug than with small, with stronger solutions than with weak, with hot solutions than with cold, and with rapid injection than with slow. Absorption is also more rapid from regions well supplied with blood vessels, for example, from the gums and from the sacral canal. The accidental *intravenous injection* of a sufficient quantity of a local anæsthetic produces primarily a very different effect, namely, convulsions. These may or may not be accompanied by the foregoing signs. The preliminary use of a barbiturate tends to prevent convulsions, and treatment consists in the intravenous administration of a barbiturate and the inhalation of oxygen.

The undesirable effects produced by *epinephrine* are very different from the foregoing. A subjective sense of fear is probably the first effect to develop. The patient is thus plunged into the worst possible emotional state to undergo an operation under local anæsthesia. Objective effects consist of a rise in blood pressure and of pulse rate, pallor, and a fine fibrillary tremour of the skeletal muscles. In severe cases there may be a sense of constriction around the chest. Further injection should be delayed until these signs and symptoms have subsided. This usually occurs in 12 to 15 minutes. The injection may then be continued with a solution containing much less of the vasoconstrictor drug. In case of severe toxicity oxygen may be of benefit.

Occasionally toxic effects may be due to rapid injection or intravascular injection. It is likely, however, that most cases of toxicity from local anæsthesia are in reality not from the anæsthetic drug but from excessive amounts of epinephrine

in the solution. With patients who state that they do not tolerate local anæsthesia well my experience has agreed with Lundy's, namely, that if very small amounts of epinephrine are used and the injection is made slowly no trouble develops.

The toxicities of local anæsthetics and of vasoconstrictor drugs are largely antagonistic. A careful balancing of the dosage might therefore *balance the antagonistic actions*. Farr and Lundy have advised using less epinephrine than is customary, and I have still further reduced the amount, with the result that even slight degrees of toxicity from either the local anæsthetic or the vasoconstrictor drug occur very infrequently. The amount that has proved satisfactory is 0.2 mg. of epinephrine (0.2 c.c. of 1:1,000 solution) for each gm. of the anæsthetic drug, whether it be procaine or metycaine. (One gm. of the anæsthetic is the amount contained in 100 c.c. of 1 per cent solution or in 200 c.c. of 0.5 per cent solution). This proportion corresponds roughly to 1 minim per ounce of 1 per cent solution, a strength merely a fraction of that commonly used in general and in oral surgery. With this proportion anæsthesia has lasted sufficiently long. New derivatives of epinephrine and of ephedrine are being subjected to experimentation and clinical trial. It is possible that one of these will be found to give better local vasoconstriction with less toxicity than the drugs formerly available.

The question is often asked, "What is the *total amount* of solution that may safely be used?" From the foregoing discussion it is evident that no dogmatic answer can be given. The anæsthetist should always be on the lookout for the signs of toxicity already enumerated, and would do well not to inject more than 80 c.c. of 1 per cent solution or 200 c.c. of 0.5 per cent solution without a pause of 10 minutes to allow signs of toxicity to develop.

APPARATUS

The syringe should be of glass, so that aspirated blood may be seen. A capacity of 10 c.c. is convenient. The nipple should be eccentric, so that needles may lie immediately beneath the skin throughout their full length without being bent. For the sake of dexterity in handling there should be rings for two fingers and for the thumb. The needles should lock on to the nipple with not more than a half turn. The

bevels of the needles should be rather short, and so ground that they face at right angles to the plane of the rings of the handles when they are in locked position. Suitable lengths are 2, 5, and 8 cm. (approximately $\frac{3}{4}$ in., 2 in., and $3\frac{1}{2}$ in.). It is convenient to have them of rustless steel so that they may be boiled in a metal box with their syringe and kept sterile, ready for use.

TECHNIQUE

There are several neglected points of technique that are applicable to many types of injection. Lundy and McCusky have shown that if skin *wheals* are to be made less painfully

the needles should be held in a manner contrary to that described in most texts, namely, with the bevel facing down rather than up. The underlying factor in the advantage of this position may be that the anæsthetic solution can be injected into the skin as soon as the tip of the bevel pierces it, whereas if the bevel faces upward its entire length must be buried in the skin before injection can take place (Fig. 1). The smallest gauge needle should of course be used.

The *bevels* of the larger needles may be thought of as runners or skids. If the anæsthetist wishes the needle to slide along under the skin or over the surface of a bone the bevel

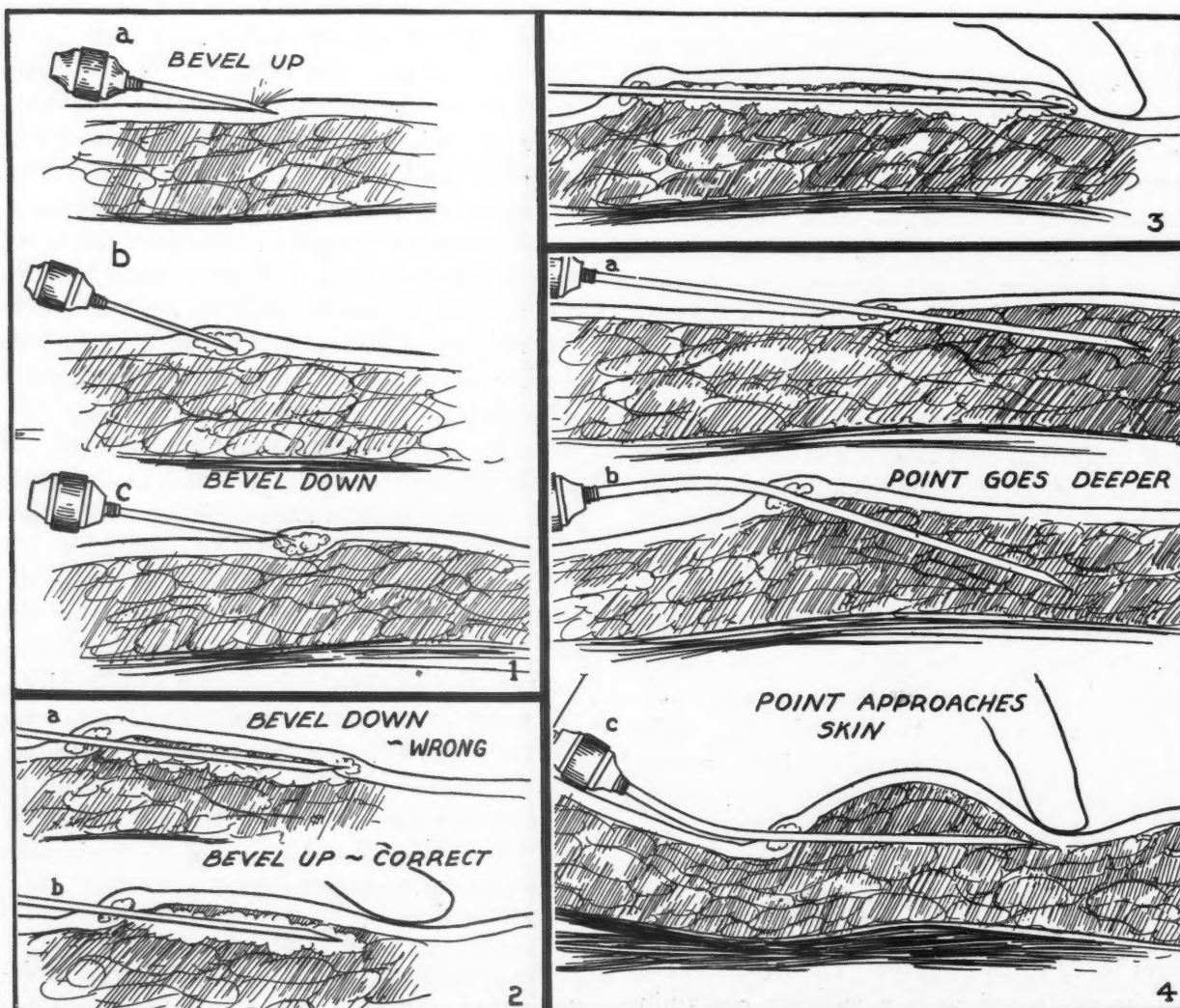


Fig. 1.—RAISING WHEELS. With bevel up (a and b) the entire length of the bevel must be buried in the skin before solution can be injected. The prick is less painful with the bevel down (c); solution can then be injected before the entire length of the bevel is buried. Fig. 2.—THE BEVEL AS A SKID. For subcutaneous injection the bevel should face up (b), so that the point will be less likely to catch in the skin (a). THE FOREFINGER AS A GUIDE (b). The left forefinger senses and regulates the depth of the point of the needle. Fig. 3.—RAISING A SECOND WHEEL. The forefinger forces the skin on to the point, to raise a wheal for the next entry of the needle. Fig. 4.—HOW TO BRING POINT NEARER THE SURFACE. When the point of the needle is deeper than desired (a), tilting the syringe upward merely sends the point deeper (b). The skin should be depressed in front of the point (c), and the syringe, if slanted at all, should point downward.

should face toward the skin or bone so as to serve like the forward upturned end of a sled runner; otherwise the point may catch in the skin or periosteum (Fig. 2).

The *forefinger* of the left hand serves as a very helpful guide during subcutaneous injection. It palpates the skin just ahead of the point of the needle, senses just how deep the point is, and depresses either the point of the needle or the skin ahead of the needle to keep the point at just the right depth (Fig. 2). At the end of a subcutaneous needle stroke it forces the skin on to the point of the needle so that

a *second wheal* may be raised from below, to make the next entry of the needle painless (Fig. 3). During the course of a subcutaneous injection, if the point gets too deep the natural tendency is to attempt to bring it nearer to the surface by pointing the syringe upward. However, this merely so curves the needle that its point goes deeper (Fig. 4). Instead, the skin in front of the point should be depressed by the forefinger, and if necessary the syringe may be pointed down also.

To avoid the *intravascular injection* of any considerable amount of solution either the needle

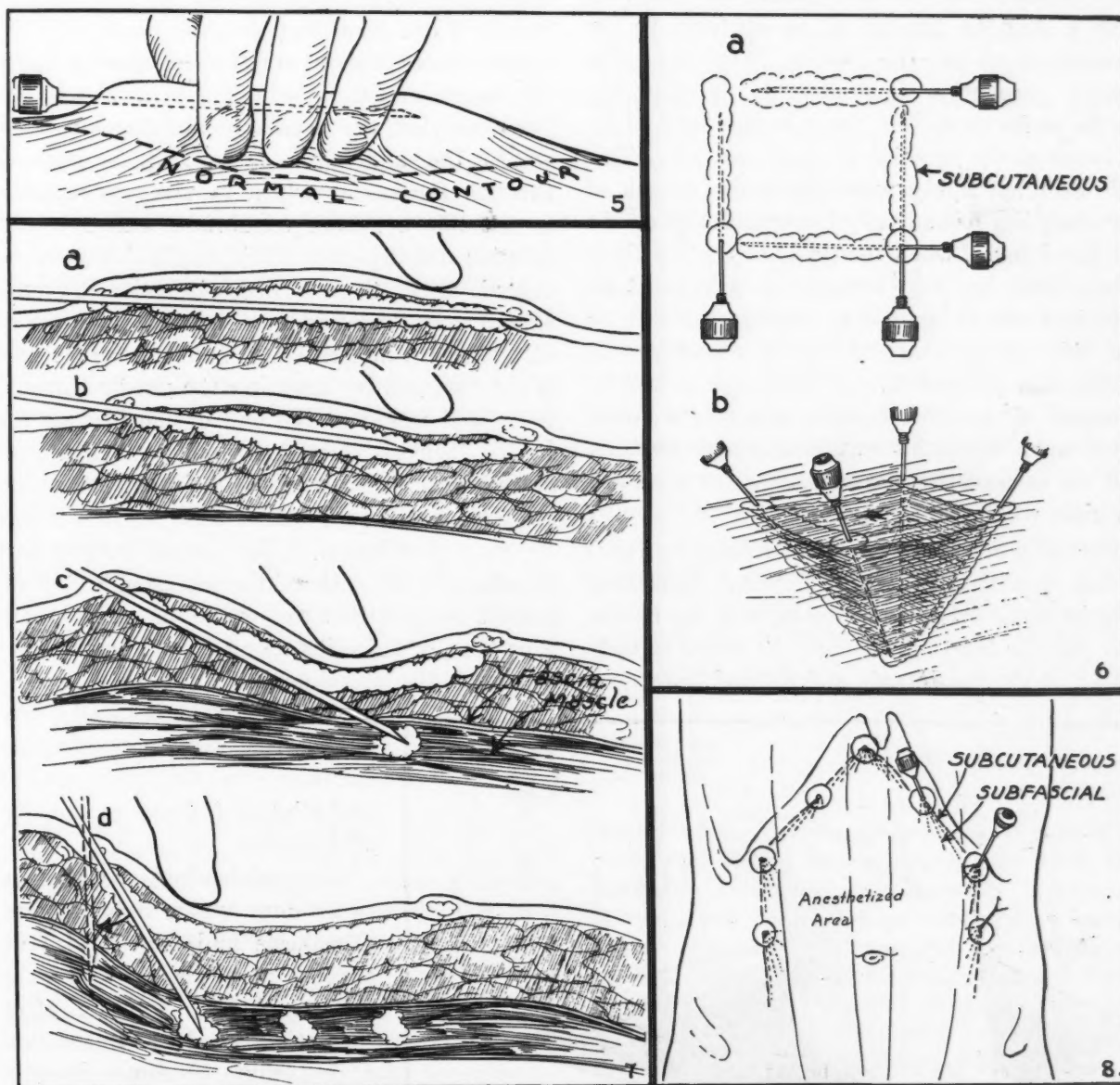


Fig. 5.—SUBCUTANEOUS INJECTION IN A CONCAVE AREA. To avoid bending the needle, the anesthetist lifts the skin until its surface is straight. Fig. 6.—FIELD BLOCK AROUND AND UNDER A SUPERFICIAL LESION. A wall of anesthetic solution isolates the lesion. Fig. 7.—ABDOMINAL FIELD BLOCK. At the end of a subcutaneous line of injection a wheal is raised from below. The left forefinger is then moved back 2 cm. (a), the point of the needle is withdrawn until it is felt beneath the forefinger (b), it is thrust through the fascia, and 2 c.c. of solution are injected (c). This manœuvre is then repeated three times (d). Fig. 8.—ABDOMINAL FIELD BLOCK. In this case there are eight of the units shown in Fig. 7.

should be kept moving or frequent aspiration should be made. Not more than 1 c.c. of 1 per cent solution should be injected with the needle stationary unless the aspiration test is performed. I have seen as much as 40 c.c. of 0.5 per cent procaine injected into a patient's neck without aspiration and without any change in the needle's position. Such practice is dangerous, and may account for some of the deaths that have occurred under local anaesthesia.

As a precaution against *breaking needles*, they should not be curved but should be kept straight whenever possible. For subcutaneous injection in a concave area the skin should be pulled up into a straight line so as to conform to the straight shaft of the needle (Fig. 5). The second precaution is to avoid inserting the needle as far as its hilt, for it is then very likely to break at the junction of shaft and hilt. This rule does not apply when the entire length of the shaft lies immediately beneath the skin. In the third place, when the point of the needle is firmly held by deep structures, care must be exercised not to bend it by pulling the skin to one side or the other at the point where the needle has pierced it. I have seen a needle snapped off as if it were a splinter of dried wood when the point was in a sacral foramen and the anaesthetist was searching for a second foramen with another needle.

For *field block of superficial lesions* an equilateral quadrangle of subcutaneous injections may be made around the lesion, and the needle may then be inserted through the wheal at each corner of the quadrangle and slanted towards a

point directly underneath the centre of the lesion. In this way a cone-shaped wall of solution may be deposited under and around the lesion (Fig. 6).

For *abdominal field block* the location of the wall of anaesthetic solution will depend on the site of the proposed incision. It may advantageously be built of units formed as shown in Fig. 7. A skin wheal is raised with the 2 cm. needle, and then with the 8 cm. needle subcutaneous injection is made extending the whole length of the needle, and a wheal is raised from below at the end of the stroke. The left forefinger is then placed over the shaft of the needle, 2 cm. from its point, the needle is withdrawn until the point is felt to lie directly under the finger, and the needle and syringe are then tilted so that the needle points diagonally towards the abdominal cavity; it is inserted through the fascia, which in vigorous subjects is felt like a rubber membrane, and 2 c.c. of solution are injected. This manipulation is repeated until 4 such deep injections, evenly spaced, have been made under the 8 cm. line of subcutaneous infiltration. A second similar unit is then started by inserting the needle through the wheal raised at the end of the first needle stroke. Successive units are made until the required wall of anaesthetic solution has been completed (Fig. 8). Each unit requires about 10 c.c. of solution. To ensure satisfactory anaesthesia the entire injection should be repeated, so that 160 c.c. would be used in all. This type of injection along the anterior costal margin or the lateral border of the rectus muscle

produces anaesthesia of all structures, from skin to peritoneum inclusive, in the area medial and slightly inferior to the line of injection.

If an abdominal operation is to be done under light general anaesthesia and field block, the surgeon may wish to inject the local anaesthetic solution after the patient is asleep. In the case of a midline or rectus muscle-splitting incision this may be done most easily after the abdomen is opened. With his left hand the surgeon lifts the cut edge of the abdominal wall (Fig.

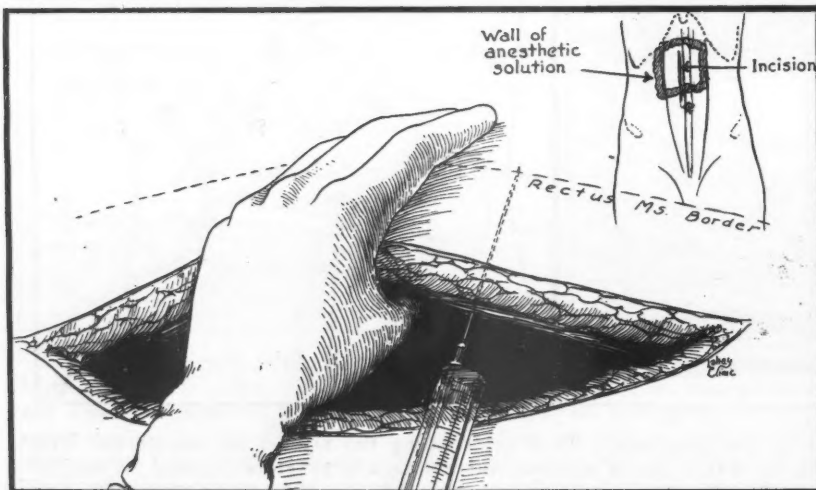


Fig. 9.—ABDOMINAL FIELD BLOCK AFTER INCISION. A wall of anaesthetic solution is built up along the lateral borders of the rectus muscles and above and below the wound.

9), and with the syringe in his right hand inserts the needle until its point reaches the lateral border of the rectus muscle. After each injection of 2 c.c. the needle is withdrawn slightly and reinserted with the point a little more cephalad or caudad than it was before, and with each filling of the syringe the needle is entirely withdrawn and reinserted in a new location. Common faults are to inject too near to the wound edges, to skip certain areas, including those at the ends of the wound, and to use not enough solution. The anæsthetic should be deposited at the lateral borders of the rectus muscles, the wall of solution should extend entirely around the wound, and between 120 and 180 c.c. of solution should be used. In the cases in which 0.5 per cent metycaine has been used in this manner marked relaxation of the rectus muscles has developed with surprising rapidity.

SUPPLEMENTARY ANÆSTHESIA

Honesty must be the rule in deciding whether an injection has really produced anæsthesia. Though they belong to a phase of my life long past, I remember vividly the agonized groans of a friend, a physician, when his rib was being resected for empyema. Circumstances were such that I could not go to his aid. The next day the surgeon met me and said, "I did Dr. F. under local anæsthesia yesterday. It was perfect—he didn't have a bit of pain." When anæsthesia does not follow the injection of the solution we must be ready to supplement by other methods.

SURGICAL TECHNIQUE

The best local anæsthesia may be rendered utterly futile if the surgeon uses a technique adapted only to spinal or to deep general anæsthesia. The patient loses all confidence and becomes a prey to adrenin over-secretion if a towel clip is put through the skin beyond the anæsthetized area. The surgeon should ask for a "scalpel", not for "the knife". Sharp dissection should be used rather than blunt. Pressure and traction should be avoided, and sponging should be done with the greatest of gentleness. The edges of an abdominal wound should be lifted upwards rather than retracted laterally. Only those surgeons who are willing to adopt the necessary gentleness and nicety of technique required by local anæsthesia should attempt to work with it.

SUMMARY

The several points of technique that have been described are applicable to many types of local anæsthetic injections, and have been found helpful in developing dexterity and in attaining success through more careful placement of the solution. The use of metycaine instead of procaine appears to make failures less frequent. With minimal quantities of epinephrine patients are much more comfortable than with the amounts customarily used, and marked toxic effects are rarely produced. Good preliminary narcosis is a *sine qua non* of success. It should relieve pain and fear, yet avoid producing delirium.

LEUKEMIC BLOOD FOR AGRANULOCYTOSIS. — T. Deglmann was encouraged by Bock's recent experience in the treatment of agranulocytosis with the transfusion of blood from a case of myeloid leukæmia to repeat this experiment in an apparently desperate case of his own. His patient was a woman, aged 28, who on admission to hospital was partially unconscious and suffering from high fever and a progressive necrotic stomatitis. The clinical diagnosis of agranulocytosis was confirmed by a blood count, which showed only 1,200 leucocytes per c.mm. There were no granulocytes, monocytes, or eosinophiles, and only a few lymphocytes. The prognosis being very bad, 500 c.c. of blood were transfused from a man, aged 39, who suffered from myeloid leukæmia

and belonged to the same group as the recipient of his blood, which showed 200,000 leucocytes per c.mm. The transfusion was well tolerated except for an attack of shivering, and it was repeated after a short interval, 500 c.c. being again injected, this time without any reaction. The leukæmic donor was compensated for his loss of blood by a transfusion of normal blood from the patient's mother. The author is inclined to attribute his patient's recovery to the receipt of 1,000 c.c. of leukæmic blood, of which the leucocyte content was equivalent to that of 40 litres of normal blood.—*Dtsch. med. Wschr.*, November 5, 1937, p. 1694. Abs. in *Brit. M. J.*

THE CYCLOTRON AND ITS CONTACTS WITH X-RAY AND RADIUM THERAPY

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1. INTRODUCTION

EARLY in the present year McGill University decided upon the erection of a radiation laboratory and the installation of a cyclotron. The object of the present article is to review briefly the chief characteristics of this powerful research tool of the physicist and to indicate some of the points of contact which the new field of activity has already made with x-ray and radium therapy. Upon examination of the facts it is found that, while the cyclotron (through artificial radioactivity and neutron radiation) opens the door to an enormous range of new research activity in the physical and biological sciences, some of the older procedures based upon x-rays and the natural radioactive substances may be retained with value unimpaired.

As demonstrated by Rutherford more than a quarter of a century ago, each atom has a compact and very tightly bound structure at the centre (called the nucleus) and a relatively loose outer structure of electrons. Changes in the nucleus result in radioactivity, while changes in the outer atom may produce the spectrum or other ordinary physical or chemical activity. A great contrast, however, results from the fact that the speed of particles emitted in natural radioactivity is such as may be matched artificially only by the application of millions of volts to such particles, whereas changes in the outer structure commonly amount to only a few volts. Thus a low voltage is sufficient to excite the optical spectra of the elements, but it may require millions of volts to produce a certain change in a given nucleus. And for this general reason the spectra and other physical and chemical changes have become well known through experiment, while for lack of high voltage equipment most nuclei have remained "duds" through the centuries. It is true that a few naturally radioactive nuclei have revealed the character of some of

the possible nuclear changes, but of course only those changes which take place when these nuclei progressively tumble down from unstable forms to stable inert conditions. Some additional characteristics were brought out by a series of experiments initiated by Rutherford, who first by design changed a nitrogen nucleus into one of oxygen. This was done by bombardment of nitrogen gas with the fast alpha particles (helium nuclei) emitted in natural radioactivity. The alpha particle was caught, and from the resulting complex structure a proton (simple, light hydrogen nucleus) was immediately released. Similar results were obtained by alpha bombardment of other light elements, yet in the case of beryllium Chadwick discovered that a new particle, the neutron, was set free. Since this particle (which is only slightly heavier than a proton) carries no electric charge, it is not retarded in its progress through matter unless by direct collision with other nuclei. When such collisions do take place, however, the neutron may enter into the nucleus, since it is not opposed by the very strong electrostatic forces experienced, *e.g.*, by the alpha particle or proton. This newly discovered particle does indeed enter most nuclear forms it encounters. Thus is formed in many cases an unstable and therefore radioactive nucleus of the chemical element under bombardment. This has been studied by Fermi following the discovery of artificial radioactivity by Curie and Joliot through alpha bombardment of boron.

The object in tracing briefly the origin of artificial radioactivity is to stress the fact that while the cyclotron is by all odds the best source of artificially radioactive substances it is not the original source. But, having said this, it must in justice be added that new and important types of nuclear reactions have been discovered by means of the cyclotron, and further fundamental progress of this nature may be expected.

2. DESCRIPTION OF THE CYCLOTRON

Invented by Professor Ernest Lawrence, of California, for the production of high speed ions of hydrogen and helium, the cyclotron enables one to reach this objective by *successive accelera-*

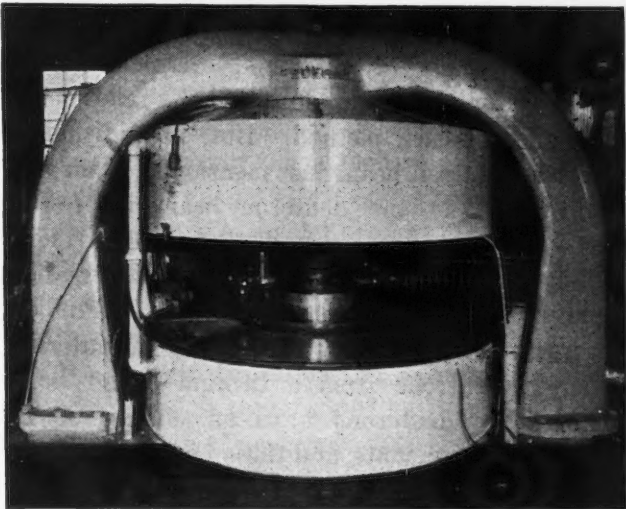


Fig. 1.—General view of the Berkeley cyclotron.

tions of the same ions with the same moderate voltage. The instrument is based on the fact that an ion circling in a plane perpendicular to a magnetic field makes the circuit in the same time, no matter what its linear velocity. The angular velocity is constant. Thus an ion circulating in such a field may be repeatedly accelerated by successive applications of about 40,000 volts from a radio oscillator with which the ion remains in resonance. In this way Lawrence has been able to give to heavy hydro-

eighty-five ton electromagnet (bottom section below floor level). The coils for excitation are in the large tanks, which are fitted for oil cooling. Between the oil tanks the pole pieces may be seen, and filling the gap between the poles is an evacuated metal chamber in the form of a shallow pill box. It is in this chamber, or "tank", that the ions are accelerated.

A somewhat simplified horizontal cross-section of the tank (which usually contains heavy hydrogen at very low pressure) is given in Fig. 2. A and B are the halves of a thin hollow copper pill box, and are insulated from each other as well as from the tank case. They help to form the condenser part of a radio circuit which is coupled to the radio oscillator as shown in the diagram.

For a simple discussion of the operation of the cyclotron, suppose that a heavy hydrogen ion (deuteron, or proton and neutron bound together) is formed at P when the maximum negative potential is impressed on A. The ion will be accelerated and due to the magnetic field will be drawn round the initial half circle of the apparent spiral, as indicated. Now the frequency of the oscillator and strength of magnetic field are so chosen that when the ion

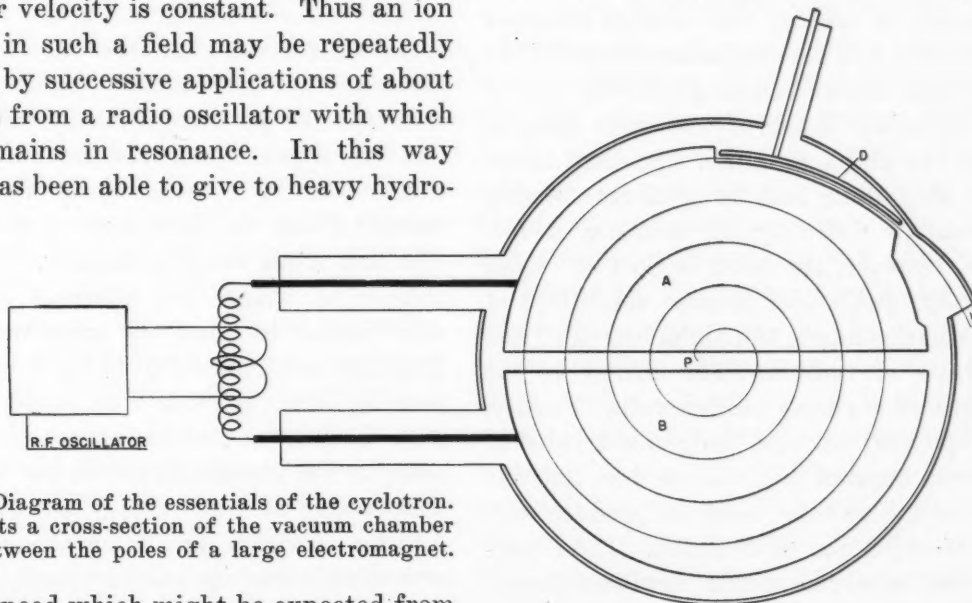


Fig. 2.—Diagram of the essentials of the cyclotron. This represents a cross-section of the vacuum chamber which fits between the poles of a large electromagnet.

gen ions a speed which might be expected from a single application of seven and a half million volts.

Looking now into more details, it may be said that the present preëminent position of the cyclotron as an artificial source of fast particles was established by the Berkeley model shown in Fig. 1. Round the outside is the yoke of the

again reaches the gap between the electrodes B is at maximum negative potential and the ion gets a second acceleration by the same voltage. This process continues for seventy-five or more revolutions, the ion keeping in step with the oscillator and consequently getting an additional energy of, say, 40,000 volts each time

it crosses the gap. By this time, we shall assume, the spiral has opened up to the limit permitted by the size of the accelerating electrodes, and the ion is therefore drawn off its circular track by about 40,000 volts applied to the deflecting electrode, D. Eventually such ions strike the target with an energy of five and a half million volts, or they may pass through a thin platinum window at W, and come out into the air to produce a bright blue beam about 20 cm. long.

3. CYCLOTRON BEAM COMPARED WITH NATURAL RADIOACTIVITY

Let us now compare the beam from a cyclotron with natural radioactivity. In the first place, hydrogen nuclei are not emitted by radioactive substances found in nature; the beam just described is novel therefore as regards quality. In the second place, Lawrence has found that the number of fast particles supplied by his cyclotron in full operation is equal to the number of particles (of a different kind) emitted in the same time by 2,500 grams of radium. That is to say, the intensity of the primary cyclotron beam is enormously greater than that from any natural radioactive source. On the other hand, if helium gas is used in the vacuum chamber of the cyclotron it is possible to accelerate doubly ionized helium atoms (alpha particles) and so obtain a directed beam of the same general quality as the alpha radiation dispersed in all directions by radium and its products. Owing to the relative difficulty of securing double ionization, however, the beam is then of rather low intensity, and under present conditions at Berkeley corresponds to the alpha activity from fifteen grams of radium. The energy of the alpha particles is eleven million volts. Finally, it may be pointed out that the greatest value of the cyclotron appears to lie in the fact that the deuteron beam may be used to produce surprisingly strong beams of neutrons. The Berkeley cyclotron, when run with a beryllium target, supplies a neutron beam equivalent to that which theoretically might be produced by somewhat more than one hundred pounds of radium in a beryllium mixture. This neutron beam has been used at Berkeley directly as a new radiation in radiotherapy, and as such it will be discussed later. In addition, it is used for the direct bombardment of the chemical elements and the

consequent production of new radioactive nuclear forms of all except the lightest elements. It follows from the above that for either purpose the cyclotron is incomparably superior to any radium-beryllium source now available or contemplated for the future.

We cannot in this brief article stop to review all the means of producing artificial radioactivity, or to consider in detail the relative importance of each method. But, in addition to (1) the neutron beam just mentioned, it may be said that (2) the deuteron beam itself will activate most targets and that (3) artificial alpha particles and (4) protons are effective on many targets of low to medium atomic number. Moreover, (5) owing to release of internal energy, neutrons from a lithium target bombarded by deuterons have an energy of 15 million electron volts, and these fast particles are especially apt to knock two or more neutrons from the bombarded nucleus. By this means radioactive nuclear forms are produced which are characterized by a lower mass than the stable nuclei of the same element. Already more radioactive than stable nuclei are known.

4. NEUTRON RADIATION AND NEUTRON THERAPY

The new researches which are based on the cyclotron represent an especially wide range of interests, and are further characterized by the fact that the path from purely scientific investigations to practical applications is uncommonly short. Let us consider first what has been learned about the behaviour of neutron radiation and about neutron therapy. Owing to the absence of charge the neutrons pass through solid matter in much the same way as x-rays. They are nevertheless deflected from a straight path by direct collision with nuclei. If the impact is heavy (tennis-croquet collision) the neutron will change its course but will continue with nearly as much energy as before. If the collision is with a light nucleus, *e.g.*, the proton or hydrogen nucleus (tennis-tennis collision) the neutron is then able to put the proton in rapid motion and the energy is on the average nearly evenly divided between the two particles. Consequently, in the presence of hydrogen, as first realized by Fermi, neutrons may be slowed down to thermal velocities, the number of collisions required being as a rule 25 to 30. Any material which contains a high concentration of hydrogen

is suitable for this purpose. Paraffin cylinders of about 10 cm. radius are convenient round a radium-beryllium source, while water tanks are used in the larger installations round the cyclotron. Water two feet thick will slow down and stop all the neutrons. Returning now to the thermal neutrons, there arises the curious picture of neutrons swarming round a laboratory with little more than the velocities of light gas molecules. Even at such low speeds they succeed in penetrating the nuclei of neighbouring atoms, for there is no electrostatic repulsion. In this process, certain nuclei present an especially large cross-section for neutron capture, *e.g.*, boron, cadmium, and a few other nuclear forms scattered at random through the periodic table. The boron becomes radioactive (emitting alpha particles), and is therefore often used as a test for the presence of neutrons. The cadmium does not become radioactive,* and since a one-half millimetre thickness stops slow neutrons it is commonly used as a slow neutron screen.

It follows that when fast neutrons are allowed to pass into a biological body they of course encounter hydrogen nuclei (protons) which they put in rapid motion. Since the protons carry a positive charge they do not readily pass through matter; in fact they produce a very heavy ionization along a short path of the dimensions of several cells. This ionization (destructive action) is hundreds of times more dense than that caused by the comparatively long-range electrons put in motion in normal x-ray treatment. Doubtless this is the reason that the dosage for a given biological effect is less with neutrons than with x-rays. Through the investigations carried out at Berkeley under the leadership of Professor Ernest Lawrence and his brother Professor John Lawrence, a medical doctor, it has been learned that the ratio of x-rays to neutron dosage varies somewhat with the tissue and is commonly about five to one. Of course the above remark implies that one type of radiation will differentiate between two tissues better than the other. It has long been known that when x-ray ionization is of sufficiently low density repairs may be made in the tissues and no permanent damage results; in addition, it is known that when the density of ionization is sufficient to cause destructive

action, the effects on young cells and on malignant cells are greater than on the older normal cells. In comparative tests made with tumour implants (Sarcoma 180) and with normal mice under both radiations it was learned¹ that neutron radiation makes the better differentiation between these two tissues. Although the experiments to date are too limited to permit one to reach a final conclusion regarding the value of neutron therapy they are most encouraging, and make it quite clear that the subject must be thoroughly studied.

Before passing to other topics it should be noted that the neutron radiation so far available is very weak compared with an ordinary x-ray source, and hence comparisons have been made only on mice or even smaller objects placed very close to the target of the cyclotron. One of the problems now receiving serious consideration at Berkeley is that of making a much stronger neutron source in order to treat hospital patients. Finally, it may be emphasized again that only fast neutrons can produce the above effects. Neutrons which have passed through less than a foot of water would have energies much too low for this action.

5. RADIO SODIUM *vs.* RADIUM

During the past months there has appeared in the public press from time to time the suggestion that some of the new nuclear forms, especially radio sodium, may offer the radium industry serious competition. This point is worthy of more careful consideration. It is clear that artificial radioactivity will permit marked extensions to the work in radiotherapy—and especially so since many of the new forms are quite harmless if injected directly into the blood stream—but it is not yet clear that radium as now used in the larger units can be generally replaced by any new material. It is of course now well known that the largest units of radium are in the form of sealed "bombs" (upwards of 5 grams) which serve as gamma-ray sources for the treatment of tumours. A strong source is essential to get the necessary effect at an appreciable depth without burning the surface tissue. Now at present it is not possible to prepare radio-sodium bombs of one-fifth this intensity, and one would indeed be optimistic to predict the early delivery of artificial bombs of this strength to distant Canadian points.

* Gamma rays are emitted by newly formed cadmium nuclei.

Since the activity of sodium falls off to half value in 14.8 hours, one cannot see clearly that in our generation bombs will be prepared which will show after two days a gamma-ray intensity equivalent to that of a five-gram bomb of radium. Taking into account the fact that even if this objective were realized the sodium bomb would require adjustment from hour to hour to ensure proper dosage, one may say that sodium is not likely soon to be a competitor of radium in respect to therapy in Canada.

In order to visualize a probable extension in radiotherapy, let us consider the character of radio sodium in more detail. This new isotope, of atomic weight 24, is commonly made by deuteron bombardment of sodium metal or sodium salt. The neutron from the deuteron enters the normal sodium nucleus to form the new active product, while the proton is rejected at the time of bombardment. The active sodium nucleus eventually emits an electron (beta ray) and passes to a magnesium nucleus of mass 24. This latter is formed in an "excited" state, but becomes normal immediately with gamma ray emission. As a net result, then, ordinary sodium is turned into ordinary magnesium; but the process includes emission of beta rays of average energy about one-half million volts, and a gamma ray spectrum ranging from one to three million volts. Of course, the magnesium is perfectly harmless in biological bodies; hence the sodium may be put in the blood stream. Hamilton and Stone² have taken advantage of these features in the treatment of leukæmia. They hope to secure beneficial results by bringing the radioactive material in close contact with the base of the disease. Since there are a great many new active isotopes which lead to harmless products, and it is known that elements are selectively taken up by different tissues of the body, one may see the possibility of some selectivity in the treatment of given tissues.

6. RADIOACTIVE INDICATORS

Great success may safely be predicted for another phase of biological research already started by means of the cyclotron. Active isotopes are being introduced into biological bodies in order that they may show by their activity the rate of movement and ultimate disposition of the

chemical elements represented. This use of radioactive indicators was suggested by earlier work with the radioactive lead found in nature; it is now being extended to many elements of greater biological interest. In this simple application of the products of the cyclotron we are thinking only of the distribution of atoms. Provided the periods of the radioactive forms are sufficiently long, it is obviously possible in certain cases to build up stable molecules of which they form a part and thereafter trace the progress of the molecules. It is scarcely necessary to add that such active molecules could never be formed by placing normal molecules in the beam from the cyclotron. In that case every atom made active would at the same moment receive a blow which would knock it out of the molecular structure.

The above aspects of research based on the cyclotron have been selected as possibly the ones of most interest to readers of the *Journal*. The sketch is clearly not intended as a representation of the major interests which will guide research in the Radiation Laboratory at McGill. The new establishment will form an addition to the Physics Department, and it is otherwise evident that fundamental work in nuclear physics must receive proper development. It is hoped that a 150-ton cyclotron will be in operation one year from now.

The appended list of selected books and papers is suggested as a guide to readers who wish more detailed information regarding the cyclotron itself or the biological or other researches based upon it.

Illustrations were received through courtesy of Dr. F. N. D. Kurie and the *General Electric Review*.

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THE ORGANIZATION OF A RHEUMATISM SERVICE*

BY H. L. BACAL, M.D. AND R. R. STRUTHERS, M.D.

Montreal

RHEUMATISM in childhood has been for many years one of our great problems in Montreal. The temperate climate, with its sudden changes in weather, the social and environmental conditions of the poorer classes, and perhaps the type of homes occupied by these unfortunate children, has made this city one of the largest centres of rheumatic infection in childhood on this continent. The crippling effects of this disease can certainly be compared with those of other chronic diseases such as tuberculosis and syphilis. We have felt that rheumatism, once it becomes chronic, behaves similarly to tuberculosis and should be treated in the same manner as this chronic disease. Attacks of the various manifestations of the rheumatic cycle may recur periodically, and one attack predisposes to another. We have found, as others have, that the largest number of cases occur in the spring of the year and that the females affected outnumber the males. There is frequently a familial history of rheumatism, and the infection is uncommon under five years of age.

It is interesting that nearly all the systems of the body may be involved in this disease. The respiratory system is represented by tonsillitis, pneumonia, and pleurisy; the articular system by arthritis and bursitis; the nervous system, by chorea; the cutaneous system, by subcutaneous fibroid nodules, erythema multiforme, and occasionally erythema nodosum; the cardiovascular system, by carditis, purpura and epistaxis; the ocular system, by episcleritis; and the gastro-intestinal system, by peritonitis. These manifestations vary from time to time, and an exacerbation of any one or other of these may occur.

From study we have formed the opinion that rheumatic infection in childhood may be divided into four group types, namely:

1. *The unwell child* of poor physique, subject to recurrent respiratory infection, giving a his-

tory of "growing pains"; with no definite evidence of any of the rheumatic manifestations, yet a potential candidate for rheumatism, particularly if there is a family history of this disease.

2. *Sydenham's chorea*, nervous manifestations characterized by spasmodic aimless jerky, irregular movements of any or all the voluntary muscles of the body, varying in severity from mild to severe, accompanied by emotional and physical instability, giving such types as chorea paralytica, hemichorea and chorea insaniens.

3. *Acute rheumatic (arthritis) fever*, which is usually not very acute in children, but frequently shows symptoms of inflammation of the periarticular tissues and muscles. The joints usually involved are the ankles, knees, wrists, elbows, fingers, and sometimes the hips. The arthritis is migratory in character, responds to the administration of salicylates with surprising rapidity, and never leads to permanent disability or suppuration of the joints.

4. *Rheumatic carditis*, which is the most frequent and most severe complication of rheumatism, and stands as a spectre over the future of the rheumatic child. It is estimated that from 50 to 60 per cent of the rheumatic patients ultimately develop some heart lesion.

Since it has been our opportunity to see and treat a large number of acute, convalescent, and chronic cases of rheumatism in childhood we have been fortunate, at the Children's Memorial Hospital, in having been able to institute a "Rheumatism Service", so organized that cases are followed and observed if possible from the beginning of the disease, when they are admitted to the indoor service, until they are discharged to their homes and seen periodically in the outdoor department at the cardiac clinic. Patients suffering from acute rheumatism are first admitted to the main hospital and kept there in cubicles, under isolation precautions, until it is certain that there is no complicating infectious condition. During this time a consultation is requested from one of the staff on the "Rheumatism Service". He, in turn, if

* From the "Rheumatism Service" of the Children's Memorial Hospital and the Department of Pædiatrics, McGill University, Montreal.

the case is suitable, accepts the patient for transfer to the rheumatism pavilion.

The rheumatism pavilion is a rectangular stucco building with a large balcony across the front, with sufficient room to put all the children outdoors when the weather permits. It is supplied with abundant light and ventilation by swinging windows which completely surround the ward.

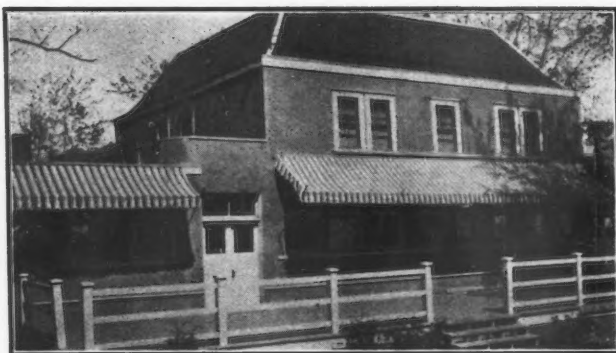


Fig. 1.—Exterior view of "Rheumatism Pavilion."

The pavilion is supplied with high and low pressure steam, the low pressure for radiators. The high pressure is led to two Dunham Unit heaters situated in the basement of the hut, each of which is fitted with a speed motor. A small perforated steam pipe is led into the air trunks, and small jets of steam are driven into the hot air on its way to the ward. This maintains an average of 45 to 55 per cent relative humidity and a constant temperature of 70 to 72° F. One heater is used for each side of the ward. When heat is required the switch is turned on to set the motor and to drive air through the unit heaters, which are kept hot by steam and warm the air which is then discharged into the ward through floor registers.

The ward is divided into boys' and girls' sections by a glass-enclosed corridor. Swinging doors in the middle of this corridor permit easy transit from one section of the ward to the other. On one side is the office, where charts, x-rays and clinic records are kept. Opposite the office, completing the corridor, are four cubicles in which are kept newly admitted patients (cases of severe active carditis, marked chorea, and an occasional upper respiratory infection, may be put there). At the back of the office is a hall with cupboards and coat racks. At each end is a bathroom with a small elevated tub and mounting ladder and a child's toilet.

Opening into the hall is the kitchen, with an electric refrigerator and combination sterilizer and steam table. Next is the utility room with a sterilizer. Completing the floor plan is the examining room with medicine cupboard, instrument sterilizer, and electrocardiograph. From this room a stairway leads down to a clinical laboratory and an electrocardiographic dark room.

The ward is bright and attractive. The beds are painted a soft green, and the bed-side tables, chairs and walls are of a light cream colour. The children all wear brightly coloured jackets. In the boys' ward there is an aquarium, and the patients greatly enjoy watching the manoeuvres of the fish. There is a radio in each section. The ward accommodates 30 beds, divided equally between boys and girls. The children's ages vary from 17 months to 14 years. On admission the child is weighed and measured and put to bed between flannelette blankets. The rectal temperature, pulse and respiration are recorded, and a bed bath is given. Children with elevated temperature are given a soft diet with extra fluids, and those with normal temperature have the ordinary house diet with added nourishment, such as fruit juices in mid-morning, afternoon and at bed time. As a routine measure all children receive two drams of cod liver oil in an ounce of tomato juice twice a day, as well as two drams of Mistura Ferro-Catalytic (Frosst) after dinner and supper.

For acute joint pains various forms of external heat are employed, such as a hot water bottle or baker, or the affected joint may be painted with oil of wintergreen and covered with a flannel bandage. The patients receive three drams of a mixture containing salicylic acid four times a day at four hour intervals, which gives them 60 grains a day. The children with chorea receive 10 grains of aspirin and 15 grains of calcium gluconate four times a day at four hour intervals (Pearson¹). Within the first few days each patient has various tests performed, *i.e.*, urinalysis, throat culture, Wassermann, sedimentation rate, blood count, Mantoux, Schick and Dick tests, x-ray of the heart, and an electrocardiogram. The calcium, phosphorus and total protein content in spinal fluid are determined on all patients with chorea.

As the children are usually in the ward for at least three months there are some special nursing problems. They must be taught to be passive, must be kept happy, warm and well fed, and must have physical, mental and emotional rest. The rest period before meals and the rest period from twelve noon to three in the afternoon must be enforced. The nurse in charge and her staff must watch for and report epistaxis, skin rashes, joint and abdominal pains, the appearance of nodules, signs of chorea, pallor, sweating and malnutrition. The night nurse must carefully record the sleeping pulse at midnight and at 4 a.m. As a general rule, after the sedimentation rate has remained normal for four to six weeks standard graded exercises are undertaken by the department of physiotherapy. Bathroom privileges and allowing the child to sit up for meals are permitted only upon request of this department. It has been noticed that after the acute infection has begun to subside emotional outbursts become less frequent and at the same time the physician has usually recorded improvement in the condition of the heart. Patients requiring special examination and care by dentists, otolaryngologists, etc., receive them when needed.

We have found this pavilion to be a boon in the treatment of rheumatism. As with tuberculosis, rest, fresh air, sunlight, and nourishing food with vitamins are, so far as our present knowledge goes, the only treatment for this disease. We also feel that, as in tuberculosis, the increase in weight and the improvement in the red blood cell count and hæmoglobin is of good prognostic import.

The personnel of the pavilion consists of four physicians on service, an intern, students acting as clinical clerks, three student day nurses, one night nurse, and a technician. There is also a physiotherapist and her staff, an occupational therapist, a recreational therapist and a school teacher. The latter four members of the staff do not begin to function until the patients are clinically ready for them, and not until the sedimentation rate, which is done every second week, has been normal for four to six weeks.

Work done by the authors^{2, 3, 4} in the past years has led them to believe that the sedimentation rate is the best criterion for determining the activity of rheumatic infection in childhood. We have found that:

1. Acute rheumatic fever is a manifestation in which the sedimentation rate falls rapidly from a high level to normal, following the subsidence of symptoms.

2. Chorea is a manifestation in which the sedimentation rate is constantly normal, even slightly below normal in the absence of complications. There the disappearance of the clinical manifestations and a gain in weight are signs of inactivity.

3. Carditis is a manifestation in which with recovery the sedimentation rate falls slowly during a period of months to a normal level.

From this we have concluded that the sedimentation rate is the most delicate test for the activity of the rheumatic process, since observation of the body weight, temperature, pulse and total white blood count show that these tend to return more rapidly to normal than does the sedimentation rate. We might call attention again to the observation that rheumatic nodules tend to appear during the subsidence of the disease, as shown by a falling sedimentation rate. We have found that a critical fall in the sedimentation rate may precede cardiac decompensation and the appearance of oedema, and is of serious prognostic import.

When the sedimentation rate results indicate that the time has arrived for gradual exercise, the doctor refers the patient to Miss E. Asplet,⁵ Director of the Physiotherapy Department, for treatment. The patients are graded under the following functional classification for patients with heart disease.

Class 1.—Patients with organic heart disease, able to carry on physical activity without discomfort.

Class 2.—Patients with organic heart disease unable to carry on ordinary physical activity without discomfort.

Class 3.—Patients with organic heart disease, with symptoms of signs of heart failure when at rest, and unable to carry on any physical activity without discomfort.

Class 4.—Possible heart disease. Patients who show abnormal signs or symptoms referable to the heart, but in whom the diagnosis of heart disease is uncertain.

Class 5.—Potential heart disease. Patients without circulatory disease, whom it is advisable to follow because the presence or history of an etiological factor may cause disease. The

majority of the patients referred for physiotherapy are included in Classes 4 and 5, and, the children being to a certain extent actively engaged, each patient is not long confined to passive exercise.

In accordance with the late Dr. Hunt's teaching (at Guy's Hospital, London) regarding the patient's toleration of exercise, as stated by Noel M. Tidy, one observes carefully the effect of exercise on (1) respiration; (2) pulse, and (3) general appearance, in order to decide whether the patient is doing too much active work.

Respiration.—The chosen exercise is hard enough to increase slightly both the range and rate of breathing, but the patient must not be rendered breathless, as respiration should return to the normal rate during the second minute after exercise.

Pulse.—The test is usually made and found to be the principal one as to how much it is permissible to raise the pulse rate. In early cases, at the beginning of treatment, the pulse should not be raised more than six beats by any exercise. After ten day's treatment, the pulse should not be raised more than eight to fourteen beats. After three weeks' treatment, it should not be raised more than twelve to sixteen beats. After the patient gets up, it should not be raised more than sixteen to twenty beats. The pulse should have returned, or almost returned, to its resting rate (as taken before treatment) at the end of two minutes.

When the patient is up a pulse ratio is used to test the capacity to work. The hardest exercise in the given table is used, the patient's pulse being taken before beginning the exercise and immediately afterward, the pulse counted for two consecutive minutes. The latter pulse rate is then divided by the resting pulse rate, the result being the pulse ratio.

Pulse before exercise	80
Pulse after exercise (1 minute)	100
Pulse after exercise (2 minutes)	85
Rate $185 \div 80 = 2.3$	

Children, unlike adults, are unaware of the necessity for rest, and, if at all possible, will perform active movements with their arms, and if in the proximity of other children, will be as active as they can be in bed. Therefore, an occupational therapist is employed. With her aid the patient's activities are better controlled and quicker and better results are obtained.

The word "occupation" may, at first, sound unreasonable to those who believe that absolute rest is essential in the treatment of rheumatic infections. Indeed, rest is extremely important, yet it could not be expected that a ward of thirty mentally normal children, ranging in age from one year and a half to fourteen, would lie, day in and day out, in a recumbent position. Therefore, it was deemed advisable by the physicians in charge to substitute the activities which were obviously inhibiting their recovery with other activities which would actually hasten a cure. An attempt is made to keep the children emotionally and physically passive (picture cards help in promoting the desired contentment in conditions of active carditis). If the patient cannot be persuaded to lie quietly, the next best position is accepted, that of sitting supported by a specially constructed back rest. Wedge-shaped pillows with attached arm rests induce a correct posture, allowing better chest expansion. Placed across the arm of the back rest are boards which hold the work or game at a convenient level. Rest periods are arranged in accord with the patient's requirements. The entire ward has a twenty-minute period of complete quiet during the two-hour period of occupational therapy. Each case is considered individually. The sedimentation rate is closely watched and any change in the patient's condition immediately noted. Muscular activity is reduced to a minimum by providing games or simple crafts which require concentration in a small area. Tiny coloured wooden blocks, placed in mosaic style to make a design or picture, stimulate and maintain interest, keep the little patient mentally happy and physically inactive except for a slight movement of the wrist and fingers of one hand. Occupation consisting of rhythmic and repeated actions are found of value in the attempt to lessen the choreiform movements. From observation made on this ward during the past year, we feel justified in stating that these random movements can be kept considerably under control when the mind is diverted. Knitting, sewing, lino-cutting, leatherwork, ship models, and novelty making are among the occupations taught the older children before they are discharged from the ward. An interest, and perhaps even a source of future financial independence, is provided for these more or less permanently handicapped

children in their inevitable struggle for existence among physically normal people. The activity during the entire hospitalization is graded and correlated with the physiotherapy given to build up resistance so that a relapse will be prevented.

The education of these children is not neglected and is in the hands of a capable teacher. The teaching is carried on as a branch of the School for Crippled Children, which institution supplies the teacher. The object of the work is to establish a preparatory grounding, particularly in reading and arithmetic, to minimize as far as possible the adjustment necessary when the patient is discharged and takes his place in the regular school. Children remaining in the hospital over long periods with illness such as tuberculous bone disease are encouraged and taught to work by themselves. With these patients the full school curriculum is followed, and on being discharged they attend the School for Crippled Children. With cardiac patients it is not possible to attempt the full program; the patient's strength is not equal to it. The greatest care has to be exercised not to press such patients or allow them to feel discouraged: the work must have a positive interest and be of therapeutic value. Geography and history become stories supplemented with drawings and maps modelled in plasticine. The aim here is to develop an interest in varied reading. Books from a good juvenile library are distributed among the patients. Learning to read is made as attractive as possible with colourful charts, vocabulary builders, and other means of converting learning into games. This preparatory work is particularly helpful for the non-English-speaking child. He has an opportunity to get a grasp of the language and is therefore not hopelessly lost when admitted to the public schools.

The recreational therapy department helps to maintain the well-being of these patients by controlled exercises, in the various forms of "play". Because it is the universal language of children, and as it is an activity which in its various forms involves the response of the organism as a whole, "play" has been found to be a useful therapeutic tool in dealing with problems arising in and from a hospital environment. How the tool is to be used, and to what end, are dependent entirely upon the specific situation at hand. The nursing staff

and the recreation department use play as a fundamental approach in dealing with (1) fear and nostalgia in newly admitted and pre-operative patients, with (2) behaviour problems which are apt to arise because of the feeling of isolation and confinement, in patients requiring prolonged periods of medical treatment, and (3) as a manner of creating with all patients confidence in, and consequently co-operation with, the medical staff. As rest is considered to be an important part of the medical treatment in cases of rheumatic fever, chorea, and carditis the problem which presents itself is to find the method or medium through which to gain both the conscious and unconscious cooperation of each individual child. Unfortunately, verbalization or talking is of little value in gaining true cooperation, as the memory span of children is relatively short in comparison with that of adults. Accepting this fact, an attempt is made, by presenting a large range of activity within physical and medical limitations, such as stories, story acting, songs, intellectual sense, and paper and pencil games, as well as folk games and highly socialized dramatic activity (such as playing "house", "store", or "hospital"), to build up a group control or behaviour pattern during the play, which will carry over into unsupervised times of the day and into the post-hospital lives of these children.

Having received the necessary care in the hospital, the patient is discharged from four to six weeks after all signs of clinical activity have ceased and the sedimentation rate has remained continually normal over this period. The following instructions are given the patient's parents on leaving the Rheumatic Pavilion.

1. Your child has been up one hour in the morning and one hour in the afternoon. Increase half an hour daily until up all day.
2. Insist on a rest in bed of 2 hours every afternoon.
3. Bed at night never later than 8 o'clock.
4. Guard against over fatigue at all times.
5. Keep in bed during periods of colds, fever or other illness, even if slight.
6. Dress warmly at all times: woollen underwear in the fall and winter.
7. Avoid damp feet.
8. Keep the child in the house during bad weather.
9. Give cod liver oil every winter.
10. Report to cardiac clinic, Wednesday afternoons at 1.30 for one month after discharge, and then every three months.
11. Report to clinic if child develops new symptoms or a return of old symptoms.
12. Report at once in case of joint pains or swelling of joints or feet.

The patients report periodically to the cardiac clinic for a check-up. This includes a complete physical examination, sedimentation rate determination, and, if possible, an electrocardiograph and x-ray of the heart. Patients failing to report as advised are investigated by the Social Service Department, and arrangements are made to have them seen regularly. Certain cases which are not suitable for hospitalization, yet are chronic sufferers and require convalescent care, are sent to the Chateauguay Convalescent Home just outside the Montreal area. This institution cares for other conditions of a chronic nature than rheumatism in children, and is controlled and supervised by a trained medical nursing staff.

CONCLUSIONS

The organization, both medical and physical of the "rheumatism" service in the Children's Memorial Hospital, Montreal, is described. The benefit both to the staff and to the patients of continuous observations by one group who are interested in a study of this disease is obvious.

Of these benefits, one of the most marked is the freedom from repeated respiratory tract infections enjoyed by a moderately isolated group in a humidified atmosphere.

From our observations we would conclude that the next advance in the study of rheumatic disease in childhood must come from the study of the bacteriology of this affection.

As the establishment of a "Rheumatism Service" has resulted directly from the interest in this disease of Dr. H. B. Cushing, physician-in-chief, the authors gladly acknowledge their indebtedness to him for help, both clinical and material.

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ADRENAL HÆMORRHAGE (WATERHOUSE-FRIDERICHSEN SYNDROME) IN A YOUNG CHILD*

By S. J. USHER, B.A., M.D.

Montreal

THE main reason for the publication of this case is to show that a diagnosis of adrenal hæmorrhage can be made, based upon a definite clinical syndrome. There are numerous case reports in the literature, but with few exceptions the diagnosis has been based upon post-mortem findings.

Adrenal hæmorrhage can occur in varying degree in such conditions as diphtheria, scarlet fever, measles and pneumonia. It also has been known to occur in new-born and still-born infants, where it is chiefly of mechanical or traumatic origin. Snelling and Erb¹ found 43 cases of adrenal hæmorrhage in 3,637 consecutive autopsies, an incidence of 1.19 per cent. Of these 15 occurred in the new-born. In older children adrenal hæmorrhage is usually of toxic or infectious etiology.

The association of fulminating purpura with bilateral adrenal hæmorrhage has long been recognized. The numerous case reports in the literature indicate that this is not a rare condition. The earliest case reports are to be found in the English literature, Voelcker being the first to describe the condition in 1894. He described a peculiar symptom complex in a child two years old, admitted to the Middlesex Hospital in London. On admission the child had been ill for 24 hours. The clinical picture included vomiting, marked prostration, high fever and widespread petechiæ all over the body. The child died 48 hours after onset and was considered a doubtful case of variola. Autopsy showed hæmorrhage in both suprarenals. This report was followed by those of Garrod and Drysdale, Batten, Andrews, Talbot and others. It remained for Graham Little, in 1901, to classify such cases as a distinct clinical entity. Waterhouse,² in 1911, reported one case

* From the Department of Pædiatrics of the School of Medicine, McGill University, and the Montreal General Hospital.

and collected 15 from the literature. He attempted to portray a definite disease picture, but added no knowledge as to the etiology, beyond observations concerning a possible bacterial cause. Friderichsen,³ in 1918, in an inclusive review, brought the literature up to date and gave a detailed description of this interesting and characteristic clinical condition, which is now frequently called the "Waterhouse-Friderichsen Syndrome". McLagan and Cooke, in 1916, were perhaps the first to incriminate the meningococcus in two case reports, which fit definitely into the picture. Since that time there have been several other reports, chiefly in the German literature, notably those by Baumann, 1931; Glanzmann, 1933; and Bamatter, 1934. In 1923 the first cases were reported from America by Rabinowitz.⁴ In the past five years there have been interesting reports by Goldzieher and Gordon,⁵ Magnusson,⁶ Snelling and Erb,¹ Aegerter, and Sacks.⁷ The latter, in a very recent article, reports two cases of fulminating septicæmia associated with this syndrome, and brings the literature up to date in an excellent review.

CASE REPORT

A white female child, aged 21 months, was admitted in coma to the paediatric service of the Montreal General Hospital on February 10, 1937. The past and family histories were completely negative. She had been breast-fed until the age of one year and had always been perfectly well. On the night of February 9th, she had gone to bed feeling well, except for a slight coryza. She slept well until 11 p.m., when she was awakened with abdominal pains. She vomited a greenish fluid during the night and was given castor oil. Her bowels moved on the morning of the 10th with a slight spotting of blood. It was noted during the night that when the left leg was moved she stiffened the muscles as if in pain. Hæmorrhagic spots appeared over her body at about 10 a.m., and she had her first convulsion at 1 p.m., which lasted for only a few minutes. She was admitted about 4 p.m. and died about 1 hour later.

When seen in the hospital the child appeared very well nourished and well developed, but was comatose and extremely toxic; temperature, 107° F.; pulse, 195; respirations 60. The colour was ashen-grey, and the mucous membranes and nail beds were deeply cyanosed. The whole surface, skin and mucous membranes, was covered with purpuric spots, small and large, the largest being 0.5 cm. in diameter. The upper respiratory tract was clear. Examination of the chest revealed moist râles over the left base. Aside from the tachycardia and feebleness of the pulse, the cardiovascular system was negative. The abdomen was slightly distended and the edge of the liver palpable. The reflexes were present, the knee jerks being hyperactive. No cervical rigidity or other signs of meningeal irritation were present. The blood picture on admission showed 8,000,000 red blood cells. The child had about 10 convulsions before death. There was incontinence of urine and fæces. She was given oxygen constantly, and blood was taken for grouping, but she died before a transfusion could be given. A diagnosis of hæmorrhage into the adrenals was made by me prior to the autopsy.

At autopsy the skin showed extensive small areas of subcutaneous hæmorrhage. Similar lesions were seen in the mouth. The only other positive findings were in the adrenals. Each weighed 5 g. The pathological findings in the two organs were exactly similar. Their external surfaces were smooth. They felt tense and were very dark red, due to a large acute diffuse intracapsular hæmorrhage. Serial sections were made of each adrenal, when the following was seen. Throughout

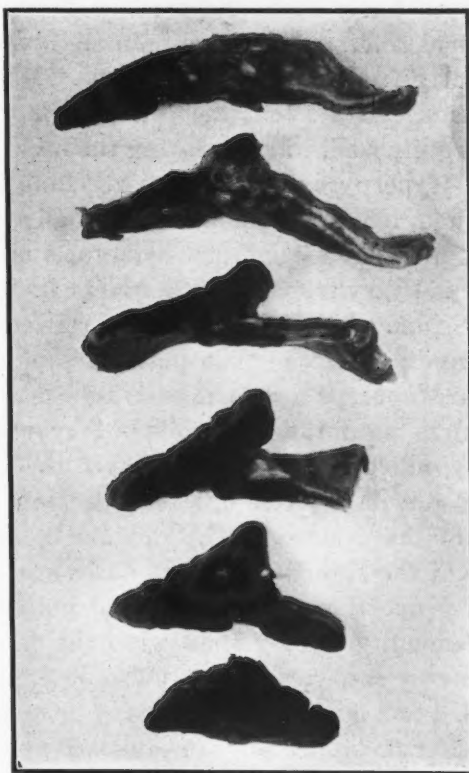


Fig. 1.—Serial sections through the right adrenal gland showing extensive hæmorrhage into the substance of the gland.

about one-half of each adrenal no normal adrenal tissues could be seen, their places having been taken by a massive acute hæmorrhage. Throughout the remaining half of the organs all the cortical and medullary tissues had not been completely replaced by blood. As the pole of the half of the organs that showed the least involvement was approached more and more medullary and cortical tissue could be recognized, until at the pole itself but little hæmorrhage was to be seen.

The thymus weighed 5 g. It showed no pathological lesion. Nowhere in the cerebral nerves were hæmorrhages found. The vessels of the pia-arachnoid and of the brain substances were moderately injected.

SYMPTOMATOLOGY

The history and symptoms in this case are so frequently repeated in the reports of other cases that one is compelled to recognize the Waterhouse-Friderichsen syndrome as a clinical entity. The majority of cases occur in young children. In the reported cases the ages varied from two months to nine years, with only approximately 10 per cent occurring in adults. About 70 per cent occurred in infants two years or younger. Goldzieher and Gordon⁵ were able to collect 37 cases of adrenal hæmorrhage in the new-born and 38 in older infants,

and reported 6 additional cases in the newborn, 5 of which were diagnosed during life. Sex plays no part. The typical history states that the patient is in perfect health until the onset of the disease. The initial symptoms are such as may occur in any acute infection, but are more likely to be referred to the gastrointestinal tract. Abdominal pain and vomiting are fairly frequent early symptoms. Many of the histories state that the child, having gone to bed quite well, awakens during the night with a cry. Hyperpyrexia is present, reaching levels as high as 108° F. at times. It is usually septic in type. Central nervous symptoms appear early, and vary from severe headache in adults, to delirium, restlessness and generalized convulsions in children. The patients soon lapse into a stuporous or semicomatose state and remain so until the end. Marked cyanosis is usually noted early in about half the cases. Magnusson⁶ lays stress upon the varying character of the cyanosis. The lips and nails are blue and the skin livid. The cyanosis is quite out of proportion to any degree of pulmonary involvement, but, together with the marked increase in respiration and pulse rate, it has often led to a mistaken diagnosis of pneumonia. Soon after the appearance of cyanosis, petechiae may be noted scattered over the trunk, face and extremities. The onset is sudden and they increase in size rapidly, becoming confluent, so that the skin takes on a blotchy appearance. Over the contact areas, the entire surface is involved, so that it assumes the appearance of post-mortem lividity. The rash remains until death, usually from six to ten hours later. At this time examination reveals an extremely toxic, often comatose, child, breathing shallowly and rapidly. Physical examination of the chest may reveal moist râles over the bases. There are no characteristic neurological findings. Cervical rigidity is usually absent. The usual course lasts from 24 to 48 hours, although the majority of cases terminate within 24 hours. Other less frequent findings are a disparity between the high oral and rectal temperatures and the low surface temperature, tremors of the extremities, and muscle flaccidity.

The laboratory is of little help in diagnosis, aside from the possibility of finding meningococci in blood smears from purpuric areas as suggested by McLean and Caffey.⁸ Because of the fulminating character of the disease there

are few detailed reports of the blood picture. There is usually a leukocytosis with a shift to the left. Three reports mention platelet counts, two of which were within normal limits and the third definitely lowered. Coagulation and bleeding time have been found to be within normal limits by several authors. Hypoglycæmia seems to be frequently present in these cases, at least during the time immediately before death. Elevation of the non-protein nitrogen of the blood has also been described.

PATHOLOGY

The most constant pathological finding is a massive bilateral adrenal hæmorrhage. This was present in about 95 per cent of the reported cases. Occasionally, only one adrenal is involved and, when so, it is usually the right. The hæmorrhage may vary from multiple pin-point areas, to a massive type, converting the adrenal into a blood cyst. It is nearly always confined within the limits of the capsule of the gland. In only one of the reported cases was rupture noted, with a resultant hæmorrhagic peritonitis. Microscopically, the densest hæmorrhage appears to be in the region of the medulla and zona reticularis of the cortex. It apparently involves the other layers by diffusion. Thrombosis or embolism is rarely seen, and an inflammatory reaction is usually absent. The skin lesions are usually due to direct involvement of capillaries and arterioles by the causative organism. Examination of the brain reveals only a congestion of the superficial vessels of the leptomeninges. An enlarged thymus is found frequently, with prominence of the mesenteric lymph nodes, hyperplasia of Peyer's patches and solitary lymphoid follicles of the intestines. This thymolymphatic prominence has been pointed out by Rabinowitz⁴ and Bamatter. The latter believes it to be a factor of some importance in view of recent work showing a definite correlation between status thymolymphaticus and adrenal hypoplasia.

ETIOLOGY

The chain of signs and symptoms that characterize the Waterhouse-Friderichsen syndrome is most probably caused by a bacterial invasion of the blood stream. This view has resulted in bacteriological examinations being carried out in a number of cases. McLagan and Cooke in 1916, were the first to definitely incriminate the meningococcus. Herrick⁹ has emphasized the

fact that it is in the fulminating type of meningococcal infection that a striking purpura is most apt to be found. It is, moreover, in this type of case that adrenal hæmorrhage is seen, rather than in the usual manifestations of meningococcus infection. The splendid work of McLagan and Cooke, McLean and Caffey,⁸ Bamatter, and several others leaves little doubt that the disease is most frequently caused by the meningococcus, although other organisms may occasionally be the cause. It would be of interest to make blood-sugar determinations and adrenalin blood-sugar graphs in cases of meningococcal sepsis with dermal symptoms.

PROGNOSIS AND TREATMENT

The disease has up to now been almost universally fatal. The duration is rarely longer than 24 hours. In the few cases where it lasted more than 48 hours hæmorrhage into only one adrenal was found. Treatment is largely based on theoretical grounds. Intravenous injection of sodium chloride solution has been suggested, as there is a rapid loss of sodium ion from the blood stream, followed by fluid depletion. The administration of large doses of potent adrenal cortex extract along with epinephrine to increase its efficacy would seem to be indicated. Since so many of these cases are associated with a meningococcal septicæmia the intravenous use of antimeningococcal serum should be tried. Supportive treatment should be carried out with blood transfusions and intravenous dextrose, as there is usually an associated hypoglycæmia. In spite of the general opinion voiced in the literature that adrenal hæmorrhage is not amenable to treatment, vigorous treatment along the above lines may save some of these patients in the

future. There is no doubt that many subjects have recovered spontaneously, as indicated by signs of previous hæmorrhage in patients who came to autopsy for other reasons at a subsequent time.

SUMMARY

A case of bilateral hæmorrhage into the adrenals (Waterhouse-Friderichsen syndrome) in a two-year-old child is described, in which a diagnosis was made before autopsy. No etiological agent could be found. A review of the literature reveals agreement in the clinical picture, consisting essentially of a fulminating septicæmia, associated with a striking purpura and intense cyanosis, with death in from 16 to 24 hours. Massive, bilateral adrenal hæmorrhage is the most common post-mortem observation. The etiology in the majority of cases is probably a fulminating meningococæmia. The suggested treatment includes adrenal cortex extract, epinephrine, sodium chloride, fluids, antimeningococcus serum, dextrose and transfusions.

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EFFECT OF DIURESIS BY MERCURIALS ON CLINICAL COURSE OF CONGESTIVE HEART FAILURE.—L. E. Hines states that a study of a series of hypertensive and arteriosclerotic patients with heart disease and congestive failure suggests a decrease in the duration of life after the use of mercurial diuretics. A high incidence of uræmia was observed in the group. The known effects on the blood produced by mercurial diuretics show some points of similarity to the changes in the blood observed in uræmia. Harmful effects from mercurial diuretics probably result from rapid removal of large quantities of oedema fluid rather than from mercurial damage to the kidneys. Mercurial diuretics should be used conservatively. As a consequence of this study each patient with congestive failure is subjected to a more critical study before salyrgan is used. To prevent possible harm the following plan is instituted. (1) Salyrgan is used only when rest, digitalis and xanthine diuretics fail to produce the desired diuretic response. (2) The pre-

liminary examination includes estimates of the plasma chloride content, the urea nitrogen content, the carbon dioxide combining capacity and the blood phenol content; the drug is not given if markedly abnormal values are observed. (3) During the period of diuresis determinations are made, frequently if symptoms suggest the onset of uræmia. (4) Marked lowering of the plasma chloride content, if associated with mental symptoms, points to a need for the intravenous administration of saline solution. (5) Lowering of the carbon dioxide combining capacity with symptoms of acidosis requires restriction of ammonium chloride and administration of sodium bicarbonate and dextrose. (6) The first dose of salyrgan should be given intramuscularly to eliminate the danger of the rare hypersensitive reaction. (7) Secretions of large amounts (from 5 to 10 litres daily) is more dangerous than secretion of smaller amounts; doses of from 0.25 to 0.5 c.c. in some cases produce an adequate response.—*J. Am. M. Ass.*, 1938, 110: 202.

ACUTE CHOLECYSTITIS*

BY JAMES McKENTY, M.D., F.A.C.S., F.R.C.S.(C.)

Winnipeg

DURING the last decade of the nineteenth century the profession debated whether early operation or interval operation, that is, operation after the subsidence of the attack, yielded the better results in acute appendicitis. In 1895 Sahli,¹ then Chief of the Medical Clinic at Berne, Switzerland, reported from a study of 6,740 cases that medical treatment of the first attack had a mortality of 8.8 per cent and of subsequent attacks a little higher. Prior to Sahli's report the mortality of non-surgical treatment of appendicitis was not definitely known. Before the end of the century many surgeons reported mortalities of less than 3 per cent from early operation. Thus was the problem of acute appendicitis finally settled in favour of early operation.

A quite similar problem now exists regarding the treatment of acute cholecystitis, that is, whether early operation or operation in the interval after the subsidence of clinical symptoms is the better plan. All surgeons agree that operation is necessary for complete cure, but hold diverse views on when the operation should be undertaken. The mortality of the medical treatment of an attack is unknown, and the proportion of those recovering who have subsequent attacks is also unknown. In the absence of knowledge on such important points a conclusion as to the best method of treatment cannot be formed with certainty. In the recent literature I find 358 cases reported to have received medical treatment only, and 77 more were found in the records of the hospitals of Winnipeg, making in all 415 treated medically, with 23 deaths (5.2 per cent), and without improvement in 94, making 117, or 26.7 per cent, in whom medical treatment failed. Four hundred and fifteen is too small a number on which to base a conclusion as to the efficiency of medical treatment of an attack but it is at least suggestive. During ten years of general practice from 1890 to 1900 I lost 3 cases under medical treatment. My impression, guess or surmise, is that the mortality

of medical treatment is at least 5 per cent, and that it fails to give relief in about 25 per cent. But the impressions of even an old practitioner, if not based on carefully studied data, have no scientific value. If general practitioners would keep records of the number of cases coming under their care and the results of treatment, much data of value in the solution of the problem of acute cholecystitis might be accumulated.

THE DIAGNOSIS

Every attack of acute cholecystitis begins as biliary colic. Only when it occurs as a complication of typhoid fever, that is, when hæmatogenous in origin, may the colic be absent. Biliary colic that continues for more than 12 or 18 hours should be considered to have an inflammatory basis, especially if muscular rigidity in the right upper quadrant persists between the spasms of colic. If a tender mass can also be felt in the gall-bladder region the diagnosis of acute cholecystitis may be regarded as positive. Systemic symptoms are more likely to be absent during the first 24 hours. Vomiting occurs in about 75 per cent. Inflammation of a high-lying appendix may be difficult to exclude. The colic of the onset of appendicitis is, however, much less intense than that of biliary colic. The practitioner should also remember that coronary thrombosis may simulate colic in the upper abdomen. Diagnosis is in 90 per cent of cases easily made, as it should be, within 48 hours of the onset of colic.

SURGICAL MORTALITY

Surgery is called upon when the condition of the patient under medical treatment becomes worse, as was the custom with acute appendicitis 45 years ago. Table I, giving reports covering 3,507 cases operated upon with a mortality of 10 per cent, includes those admitted to hospital in a moribund condition. In the 26 essays covered by Table I the duration of symptoms prior to operation is rarely stated, so it is fair to assume that the vast majority were operated upon after the subsidence of systemic

* Read at the meeting of the Winnipeg Medical Society, October 15, 1937.

symptoms, which is still the practice of the majority of surgeons. A mortality of 10 per cent is much too high to render this practice justifiable. That operation during the first three days of the attack, before the stage of complications has set in, might yield better results, is indicated by Table II, which shows a mortality of less than 2 per cent in 258 cases.

A study of 14 reports by Heuer² finds that operation during the stage of complications,

TABLE I.
OPERATIVE MORTALITY IN ACUTE CHOLECYSTITIS

		Cases	Deaths
Rowland	<i>The Lancet</i> , 1932, 1: 975	116	20
Pratt	<i>Am. J. Surg.</i> , 1933, 22: 46	45	10
Mentzer	<i>Surg., Gyn. & Obst.</i> , 1933, 55: 709	71	16
Zinninger	<i>Ann. Surg.</i> , 1932, 96: 406	89	7
Love	<i>The Lancet</i> , 1929, 1: 375	90	15
Smith	<i>Ann. Surg.</i> , 1931, 98: 766	107	10
Graham	<i>Ann. Surg.</i> , 1931, 93: 1152	198	11
Kment	<i>Brun's Beitr. z. klin. Chir.</i> , 1930, 150: 534	117	17
Fowler	<i>Am. J. Surg.</i> , 1933, 22: 53	545	56
Miller	<i>Ann. Surg.</i> , 1930, 92: 644	200	27
Judd and Phillips	<i>Ann. Surg.</i> , 1933, 98: 771	508	24
Heuer	<i>W. Virginia Med. J.</i> , 1930, 26: 257	56	3
Eliason and Erb	<i>Ann. Surg.</i> , 1935, 101: 460	158	10
Bass and Bird	<i>Am. J. Surg.</i> , 1936, 32: 241	10	5
Wolfson and Rothenburg	<i>J. Am. M. Ass.</i> , 1936, 106: 1978	31	3
Steinke	<i>Am. J. Surg.</i> , 1935, 27: 135	200	23
Hayes	<i>Minn. Med.</i> , 1934, 17: 319	14	0
Heuer	<i>N.Y. State J. Med.</i> , 1936, 36: 1643	124	2
Lipshutz	<i>Ann. Surg.</i> , 1935, 101: 902	20	0
Mentzer	<i>Surg., Gyn. & Obst.</i> , 1936, 62: 879	51	8
Taylor	<i>Surg., Gyn. & Obst.</i> , 1936, 63: 298	112	17
Glenn	<i>Ann. Surg.</i> , 1936, 103: 77	80	4
Branch and Zollinger	<i>New Eng. J. Med.</i> , 1936, 214: 1173	229	24
Boyce and McFettridge	<i>Surg., Gyn. & Obst.</i> , 1936, 53: 43	35	10
Heyd	<i>Ann. Surg.</i> , 1937, 105: 1	34	5
Graham, R. R.	<i>Canad. M. Ass. J.</i> , 1935, 32: 283	120	8
Local Hospitals		71	12
Author		76	5
		3,507	352
		(10% Mortality)	

that is, during the second and third weeks, has as an average mortality of 46 per cent. During this stage a drainage operation may be necessary in order to save life, as in the following case.

Mrs. S. was admitted to hospital eight hours after the onset of colic. In deference to the view then generally held that operation during colic is inadvisable, she was treated medically. Systemic symptoms steadily became more intense, the temperature on the fourth day

reaching 104° and the pulse 140. A cholecystostomy then was done under local anæsthesia, and in five days she was free from symptoms. She refused further operation and went home on the twentieth day after operation with a biliary fistula which discharged intermittently for more than two years, then closed, and she returned with another attack of acute cholecystitis. This time a partial resection of the gall sac was done, followed by a very stormy convalescence, complicated by subphrenic abscess and empyema of the right pleura, requiring in all a stay of 3½ months in hospital. My refusal to do a cholecystectomy during colic on her first admission was a serious blunder involving prolonged and dangerous morbidity. Done at that time the mortality of cholecystectomy is not greater than in the chronic case.

TABLE II.
THE MORTALITY OF OPERATION DURING THE FIRST THREE DAYS

		Cases	Deaths
Hayes	<i>Minn. Med.</i> , 1934, 17: 319	10	0
Heuer	<i>N.Y. State J. Med.</i> , 1936, 36: 1643	124	2
Lipshutz	<i>Ann. Surg.</i> , 1935, 101: 902	6	0
Taylor	<i>Surg., Gyn. & Obst.</i> , 1936, 63: 298	19	1
Graham	<i>Ann. Surg.</i> , 1931, 93: 1152	20	1
Zinninger	<i>Ann. Surg.</i> , 1932, 96: 406	12	0
Pratt	<i>Amer. J. Surg.</i> , 1933, 22: 46	23	0
Stone and Owings	<i>Ann. Surg.</i> , 1933, 98: 760	3	0
Meranze et al.	<i>Archiv. Surg.</i> , 1937, 35: 87	16	0
Author		25	1
		258	5
		(1.9% Mortality)	

My review of the literature leads me to agree with Heuer; (1) that acute cholecystitis should be considered in reports apart from instead of being included with other forms of biliary tract disease; (2) that the day on which operation is performed should be counted from the onset of colic and not from the admission of patient to hospital, and that the term "early" should be avoided as being too indefinite.

THE PATHOLOGY

The study of the pathological condition disclosed by operations upon the living has done so much to clarify our understanding of intra-abdominal disease that the operative findings in my 76 cases of acute cholecystitis may be worth presenting. A classification into the uncomplicated and the complicated I have found the most satisfactory.

1. *The uncomplicated.*—In 35 operation was done during this stage, finding in 34 a large stone in Hartmann's pouch or a smaller one impacted in the mouth of the cystic duct and completely obstructing the duct. The gall sac is always greatly distended, its walls oedema-

tous, from 0.5 to 1 cm. in thickness; the contents slightly bile stained muco-purulent liquid with stones in 34 of the 35 cases. The peritoneal coat usually retains its lustre but may present patches of inflammatory lymph, less often recent frail omental adhesions. The colour of the sac is usually a deep purplish pink. The mucosa shows necrotic patches in a few cases, is always soft and easily detached from the underlying fibro-muscular coat. I have found this type of lesion in those cases operated upon within five days of the onset of colic, rarely after the first week. The view that the marked thickening of the gall bladder is due to obstruction of lymph and venous channels by the stone impacted in the lower end of the gall sac is growing in favour; and the fact that in this stage the bacterial count is often negative and always low supports the view that it is not primarily an inflammation of bacterial origin. Acute œdema is regarded as a more appropriate name for the condition than acute cholecystitis.

2. *The complicated stage.*—The following complications may occur in from 15 to 30 per cent of cases after the beginning of the second week. (a) Adhesions to omentum and adjacent viscera, usually dense and difficult to detach, and in a few cases leading to the formation of fistulæ between the gall sac and duodenum or colon. (b) Gangrene of the gall sac is the most frequent complication, usually in patches leading to rupture. (c) Perforation is the second most frequent complication. It has been found as early as the third day. (d) Abscess, pericholecystic, subphrenic and hepatic. (e) Peritonitis, diffuse, is the most frequent cause of death in acute cholecystitis. (f) Pylephlebitis, a rare complication, has been known to result from abscess contiguous to the portal vein or its tributaries. (g) Empyema of the gall bladder is present in the majority of cases operated upon during the third and fourth weeks. (h) Pneumonia is a more frequent complication in acute than in chronic cholecystitis. (i) Empyema of the right pleura.

The incidence of the above complications reported in the papers quoted in Table I is between 15 and 30 per cent. The longer operation is delayed, the higher the incidence of complications. The damage found in this stage of complications is beyond the reparative power

of nature to remedy. Such conditions as gangrene, pericholecystic abscess, perforation and peritonitis, all require surgical intervention to effect cure.

Thirty-nine of my 76 cases were found to belong to this stage. In 7 pericholecystic abscesses were present, and in 5 rupture of the gall sac had occurred through a gangrenous area with extravasation of pus and stones into a pocket walled off by duodenum, liver, transverse mesocolon and omentum. In all the abscess was effectively circumscribed; consequently a spread of infection from such abscesses must be rare so long as bile does not enter the gall bladder. The obstruction to the cystic duct, however, ceases soon after the extrusion of the contents of the gall sac through the perforation, and the bile then carries infectious material from what was previously a well circumscribed abscess into the peritoneal cavity, setting up a peritonitis either local or diffuse. Colp and Ginzburg,³ in an analysis of 130 autopsies on patients dying from biliary tract disease, found that peritonitis accounted for one-third of the fatalities from acute cholecystitis. In my 76 cases stones were found in 71, or 94.6 per cent.

PROGNOSIS

With the above operative findings in mind we are in a position to consider the result to be expected in those patients who recover from the attack under medical treatment. In those in which the symptoms subsided within one week the pathological process will most likely not have advanced beyond that found in the uncomplicated stage. We know that a gall bladder into which bile does not gain entrance soon becomes a septic sac, that is empyema. Those into which bile does gain entrance may undergo a degree of resolution resulting in a sac largely transformed into fibrous tissue without function and of no service to the system, and as it contains stones in more than 90 per cent of cases it is almost certain to give further trouble. In those in which subsidence of symptoms does not occur until after the stage of complication has been reached the best result that can be expected is empyema of the gall sac, with extensive adhesions crippling the functions of the stomach, and, by harbouring microorganisms, becoming a source of toxæmia. And when we remember that from 2 to 5 per cent of stone-

containing sacs acquire malignant change the necessity for removal becomes evident. It is evident from the above that medical treatment can never cure acute cholecystitis.

TREATMENT

1. Those cases not admitted to hospital within the first five days should be treated by the delayed plan, that is, operation should be postponed for at least two weeks after the subsidence of systemic symptoms. The liability to perforation and peritonitis makes it absolutely necessary that such patients remain under observation in hospital until deemed ready for cholecystectomy. Should signs of peritonitis develop operation must be done without delay. Such operation may have to be removal of the gall sac, but the less dangerous drainage operation should be done if it meets the indications of the operative findings. Any type of operation performed during the presence of systemic symptoms has the highest mortality.

2. When the patient is admitted to hospital within the first five days an immediate cholecystectomy should be done. If done within the first three days Table II shows that it has a mortality less than 2 per cent. This is the plan of treatment which I would urge upon the practitioner to adopt whenever possible. He should realize that prompt operation is just as important in the management of acute cholecystitis as it is in the management of acute appendicitis.

The view here presented is that of a rapidly increasing proportion of the surgeons of the English-speaking world. I also urge that a partial resection of the gall bladder, leaving the portion attached to the liver undisturbed, is, in the presence of sepsis, a safer procedure than complete cholecystectomy, which leaves a denuded, raw gall-bladder bed on the liver surface which is prone to absorb the toxins in the region.

NON-TROPICAL SPRUE.—H. Stalder describes briefly the symptomatology of non-tropical sprue and reports two personal cases. He believes that non-tropical sprue is probably a secondary B₂ avitaminosis. The administration of vitamin B₂, which is a compound of flavine and phosphoric acid present in yeast, has brought about a cure in one of the cases after all other therapy had failed. The blood picture was improved at the same time. The necessary dose of vitamin B₂ varies according to the gravity of the case. The favourable effect of

Thirty out of my 76 operations were partial resections with only one fatality.

CONCLUSIONS

1. Medical treatment has a mortality of about 5 per cent and fails to relieve in at least 25 per cent. Those who recover from an attack under medical treatment are never cured and are liable to repeated attacks.

2. The mortality of surgical treatment under the plan of waiting for the subsidence of systemic symptoms is 10 per cent.

3. The mortality of operations performed within three days of the onset of colic is less than 2 per cent, and the duration of hospitalization and morbidity is much shorter than under the delayed plan.

4. The most rational classification is into the uncomplicated and the complicated stages. The uncomplicated I found in those operated upon within 3 to 5 days of the onset of symptoms. The complicated are found in those cases operated upon after the first week. These complications are all highly dangerous and account for the high mortality under the delayed plan of treatment.

5. The absence of systemic symptoms or even a low leucocyte count cannot be relied upon to indicate underlying pathological manifestations of minor degree.

6. A reduction in mortality depends more upon the general practitioner than upon the surgeon. When the former is convinced of the need of prompt operation and of his responsibility for placing his patient where it can be performed, reduction in mortality can be expected.

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campolon on non-tropical sprue is probably due to the presence of small quantities of flavine-phosphoric acid in it. These small quantities may, however, be insufficient for certain grave cases of sprue. In such patients large doses of yeast may prove effective. The effect of the hormone of the adrenal cortex in sprue is uncertain, although the weakness, hypotension, anaemia, hypoglycaemia, and pigmentation certainly indicate an adrenal insufficiency.—*Schweiz. med. Wschr.*, November 13, 1937, p. 1091. Abs. in *Brit. M. J.*

CARBON DIOXIDE*

BY RALPH M. WATERS, M.D.

Madison, Wis.

CARBON dioxide as a therapeutic agent has come to be greatly overrated. As a final insult to previously deranged function it is not infrequently the cause of death. In the *British Medical Journal* for May 28, 1927, K. B. Pinson, of Manchester, England commented upon convulsions occurring during surgical anaesthesia as follows.

"I have come to regard the convulsion as largely an outcome of the extensive action of the carbon dioxide in patients who are sensitive to this naturally, or by reason of toxæmia, pyrexia, and so on, and who are under the influence of ether, a substance itself having a marked effect on breathing . . . however it may be, treatment based on this assumption has so far been successful. It is directed to the riddance of excess carbon dioxide, and must be prompt. Luckily some moments' warning is given of the impending seizure by twitching of the eyelids and mouth, jerkiness of the breathing, especially inspiration, or some strange movement or sound, and so the essential thing can be accomplished—the immediate removal of all coverings from the face before the convulsions have set in. Frame, towels, everything, are taken right away, and the air of the room given free access; any obstruction must be completely relieved. . . . In this way the carbon dioxide will diminish as much as possible by natural means. . . .

"A field for investigation is here; but the most important thing for the time being is that as many as possible should know how to recognize the condition and treat it."

On October 29, 1927, Pinson wrote in the same journal:

"My experience of this phenomenon makes me adhere to my original suggestion as to its cause; and the administration of carbon dioxide, I believe would make matters worse."

In the same journal for August 10, 1929, he says:

"When I repeat that it is an excess of carbon dioxide which affects it, I mean in conjunction with the other factors—etheration, toxæmia, pyrexia, idiosyncrasy, and, perhaps not least, an excess of oxygen."

Thus, ten years ago the answer was written to a question frequently discussed and never settled by present-day anaesthetists. The "field for investigation" is still here, but the keen observation of Pinson ten years ago, had we read it more carefully, should have saved us much dis-

cussion as to the usual stimulus of convulsions during anaesthesia.

The trigger effect of excess carbon dioxide in producing convulsions under certain exceptional circumstances is only one of its dangerous qualities. As we continue each year to meet patients with more severe biochemical and physiological imbalance, it becomes more necessary to guard carefully against the slightest derangement of normal physiological conditions which it is within our power to avoid. In the meantime we may hope for a more perfect explanation from the physiologist regarding the delicate mechanism by which our bodies maintain a proper balance in the transport and utilization of oxygen and elimination of carbon dioxide.

Clinical misapprehensions regarding the physiology of carbon dioxide seem to have had their inception in the work of Yandell Henderson in the early years of the present century. Henderson deduced from his experiments that—surgical shock results from low carbon dioxide in the blood and tissues; that low carbon dioxide in the blood and tissues is a usual accompaniment of anaesthesia; and that hyperventilation of the lungs by the use of carbon dioxide and oxygen mixtures should prevent post-operative pulmonary atelectasis. All three of these deductions are fallacious. I make this statement based upon my own personal experience in clinic and laboratory, verified amply by the experience and experiments of others.

The belief that shock is entirely dependent on low carbon dioxide is disproved by the fact that Seevers¹ has hyperventilated dogs for many hours, reducing the blood carbon dioxide to points below 15 volumes per cent, without extreme drops in blood pressure and with no evidences of shock. Carbon dioxide added to the inspired air of both men and animals whose blood pressures were low as a result of profound spinal anaesthesia has, in certain cases, resulted in a further drop of blood pressure, and has never resulted in a more sustained rise in blood pressure than could be produced by ventilating

* From the Department of Anaesthesia, University of Wisconsin Medical School.

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the lungs with oxygen alone. Eastman and Kreiselman have recently made a cinematographic record showing that, in reestablishing respiration following oxygen crisis or a complete apnoea due to oxygen want, carbon dioxide added to the oxygen used in artificial respiration has, on certain occasions, caused a further drop in blood pressure and always a less satisfactory circulatory recovery than was secured by artificial respiration with oxygen alone.

Henderson's assumption that anaesthesia is accompanied by low carbon dioxide in alveoli, blood and tissues may have had a basis during the last century. Such is far from the case in anaesthesia of the present day. Pre-operative

medication with such drugs as opium, barbiturates, tribromethanol, etc., results in a distinct decrease in minute-volume respiration, less efficient ventilation, and a piling up of carbon dioxide in alveoli, blood and tissues. Although it is true that many inhalation agents tend at first to stimulate respiration, their effect, as administered at the present time, seldom or never results in sufficient respiratory stimulation to overcome the high carbon dioxide present at the beginning of induction due to premedicant agents. In the accompanying Table I are displayed the results of gas analyses of alveolar air and blood during anaesthesia with two of the commoner inhalation agents.

That hyperventilation with carbon dioxide and oxygen mixtures decreases the incidence of post-operative pulmonary atelectasis has not been borne out by clinical experience.^{2,3} It is pertinent to note that isolated lobes of the lung with intact circulation can be shown to absorb gases at varying rates, resulting in varying degrees of atelectasis according to the receptivity of the blood for their transport. The accompanying Table taken from Lemmer and Rovenstine,⁴ gives the comparative rates of absorption to "moderate collapse" following inflation of an isolated lobe and complete obstruction of its bronchus. The figures do not, however, indicate

TABLE I.

Ethylene + O ₂ by CO ₂ absorption technique	Analysis Carbon Dioxide		
	Trachea per- centage	Artery volume per- centage	Vein volume per- centage
9:13—1' 43" After morph. $\frac{1}{4}$ + scop. 1/100		49.5	51.2
9:15—9:32 Morph. $\frac{1}{8}$ + scop. 1/200 Morph. $\frac{1}{8}$ + scop. 1/200 Induction with C ₂ H ₄ begun			
9:50	6.3	49.8	50.4
10:30	7.3	53.0	53.3
Cyclopropane + O ₂ by pharyngeal insufflation			
7:50—1' 20" After morph. $\frac{1}{6}$ + scop. 1/150		48.3	53.3
8:21—20" After cyclo. induction Accidental overdose and respiratory arrest			54.3
8:40 Technique corrected			50.3
8:42	5.4		
8:46		49.9	
8:57	5.3		49.1
9:19			51.7
9:23	4.5		

The percentage of carbon dioxide in gas samples taken from the trachea and the carbon dioxide content of artery and vein during an ethylene anaesthesia administered by the absorption technique. Note the tendency toward increasing carbon dioxide.

In the lower part of the Table are similar analyses taken during an anaesthesia administered by pharyngeal insufflation where there is an actual reduction in the normal dead space. Note that even in this circumstance, the tendency to a depression of carbon dioxide is very slight.

TABLE II.

RATE OF ABSORPTION FROM ISOLATED
LOBES WITH CIRCULATION INTACT

Gas used	Number of experiments	Average time of absorption to given point
Carbon dioxide.....	9	1 min. 6 sec.
Oxygen.....	12	1 " 20 "
Nitrous oxide.....	6	1 " 42 "
Ethylene.....	3	2 " 2 "
Air.....	12	9 " 21 "
Nitrogen.....	6	12 " 6 "

Table showing the rate of absorption to "spotty" atelectasis of isolated lobes of the lung with circulation intact. It is obvious that the absorption of nitrogen is much less rapid than is the absorption of oxygen.

satisfactorily the fact that lobes filled with the rapidly absorbed gases, when watched for longer periods, become *completely* atelectatic and liver-like in appearance; whereas such lobes filled with nitrogen tend never to become liver-like in consistency. We may conclude, therefore, that the administration of carbon dioxide must be made with a complete appreciation of its physio-

logical characteristics. First of all, we must not lose sight of the fact that it is a waste product of body metabolism, just as are the constituents of urine. Reduction in the physiological efficiency of respiration tends to dam back carbon dioxide in the tissues just as physiological disturbances of the kidney tend to dam back the excretory products usually eliminated through that organ. Secondly, we must keep in mind that all drugs used for the relief of pain have at least the tendency to interfere with the normal function of pulmonary ventilation—the non-volatile agents through their tendency to depress respiration, and the volatile agents through the mechanical difficulties of administering them without obstruction of the respiration, and without the application of a mask over the nose and mouth, which always involves some dead space being added to the upper respiratory tract. Wilful increase of this space by means of rebreathing bags or short circuiting of the expired air around alkaline absorbers means, from a physiological standpoint, that the anaesthetist is administering carbon dioxide. When he does so with a full realization of the fact and a recognition of the signs of too much carbon dioxide no harm may result. The knowledge on the part of the anaesthetist that he is adding carbon dioxide by such modifications in technique is the important fact to be kept in mind.

When one contemplates the therapeutic addition of carbon dioxide to the inspired air as it is practised in many hospitals he is forced to question the legitimacy of such therapy. With extremely rare exceptions, artificial respiration without carbon dioxide would doubtless serve the patient much better. The anaesthetist will do well to bear in mind certain characteristics of this agent. First of all, do not forget the extreme variability of its effect in different individuals and in the same individual at different times. Diseases which cause changes in transport or changes in biochemistry, or changes in metabolic activity, greatly modify susceptibility. Next, it must be remembered that carbon dioxide in concentrations above 10 per cent is incompatible with consciousness in normal human beings. The physical signs of excess carbon dioxide described by Pinson in the quotation at the beginning of this paper can scarcely be elaborated unless one is unfamiliar with the common physiological effects—a rise in

blood pressure and hyperpnœa which usually occur and which may be followed by a fall in blood pressure, respiratory depression and apnœa. Whenever hyperpnœa and high blood pressure do not accompany rebreathing or carbon dioxide administration, overdose is probably present.

In the light of our present knowledge, we at Wisconsin find the following attitude toward carbon dioxide therapy tenable on the ground of clinical results.

Shock.—Never do we apply carbon dioxide therapy or rebreathing with a view to the prevention or ameliorization of surgical shock. Simple oxygen therapy without carbon dioxide has been found more satisfactory.

During anaesthesia.—During inhalation anaesthesia, regardless of technique or drug, with the exceptions noted below, our effort is to avoid dead space and rebreathing as much as possible. Seldom or never do we find it to the patient's advantage to add carbon dioxide from a cylinder during administration. Exceptionally, we find ourselves embarrassed for ample time to accomplish induction with ether rapidly enough, to meet the demands of an overworked and harassed surgeon. On such occasions we do sometimes yield to the demand by removing the soda lime canister during induction. The use of carbon dioxide for hastening ether elimination will be discussed under hyperventilation. During anaesthesia our effort is directed toward avoiding dead space in the apparatus and toward maintaining an inspired atmosphere as near to the composition of atmospheric air as is compatible with the required depth of narcosis.

Post-anaesthetic hyperventilation.—Carbon dioxide is never administered for this purpose when mixed with oxygen nor by means of a mask and breathing bag. The induction of active hyperpnœa, which leaves in the more remote alveolar spaces a rapidly and completely absorbable medium such as oxygen, we believe does more harm than good. When we wish to accomplish rapid elimination of toxic volatile substances or gases or anaesthetic agents, a small stream of pure carbon dioxide is directed toward the face at a rate just capable of causing the desired hyperpnœa. The remote pulmonary areas likely to become inactive after hyperpnœa are thus left filled with their normal atmospheric content. The periodic administration of carbon

dioxide for lung exercise is used in a similar way, and only when cooperation of the patient cannot be secured in procuring voluntary deep breathing. If the patient is already receiving oxygen, this is interrupted during the period of hyperpnœa.

Finally, we prefer that the administration of carbon dioxide be made under the direct observation of a physician. Whenever it fails to produce hyperpnœa, or when unusual or unexpected results, such as muscle twitching, de-

pressed and irregular breathing, or poor colour supervene, immediate abandonment of the treatment is indicated.

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RESULTS IN THE MEDICAL TREATMENT OF GASTRIC ULCER*

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THE results in the medical treatment of gastric ulcer over a period of years have not received the consideration which the subject merits. The present report represents our findings in a group of patients who have had a history of gastric ulcer for several years. The previous clinical history was obtained from the hospital records and the history of the present symptoms was noted. The periods in which the patient was symptom-free were recorded. A careful physical examination was done. An alcohol test meal was carried out in each case, and the results recorded in the fasting, half hour, and one hour periods. These results were compared with previous gastric analyses. A short gastric series, including a fluoroscopic examination, was done in all cases and the results were compared with the former x-ray findings. The type of medical treatment followed, whether duodenal tube or modified Sippy diet, and the diet and management of the patient after discharge from the hospital were recorded. Considerable difficulty was experienced in collecting a group of 40 cases of gastric ulcer who had been under observation during the past five years. The records showed that the history of the disability extended from four to forty years, the average time being thirteen and a half years. The average age was 55. The youngest was 39, and the oldest 79. In this group there were 20 males and 20 females; 28 were born overseas and 12 in Canada. Epi-

gastric pain was a typical symptom in 32 cases. Pain in the majority of cases occurred from one-half to one hour after meals. Vomiting occurred in 25 cases. Hæmatemesis was present in 15 cases, and in 4 cases there was a history of two or more hæmorrhages. Flatulency was a marked symptom in 16 cases. Diarrhœa was present in 4 cases. Acute perforation occurred in only 1 case. Thirty-three patients had been symptom-free for approximately five years. Seven had symptoms of ulcer. The gastric analyses showed an absence of free HCl in 10 cases, a low free HCl, 20 per cent or less, in 10 additional cases. The highest free HCl was 78 per cent. The x-ray investigation of the stomach and duodenum showed evidence of gastric ulcer in 3 cases of this series, 2 of which also showed scarring of the duodenal cap. An organized hour-glass without ulcer was present in 4 cases. A healed duodenal ulcer, with no evidence of gastric ulcer, was noted in two cases.

This group of 40 patients was treated either with the duodenal tube or a modified Sippy diet for from three to five weeks. Twenty were treated with the duodenal tube, the majority of whom were relieved of their symptoms in from two to three days. After beginning treatment we found that patients could generally take with comfort six ounces of whole milk, with two ounces of 24 per cent cream, and a half to one ounce of milk sugar in each feeding. Six to seven feedings in twenty-four hours were given, roughly from 2,300 to 2,600 calories. The average gain in weight was three pounds; in a few

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cases the weight remained stationary, and in a few cases there was a loss of from one to five pounds. At the end of three weeks if there was still radiographic evidence of an active gastric ulcer a further course of three weeks with the duodenal tube was considered necessary. Regulation of the bowels was controlled by milk of magnesia or a simple enema. A modified Sippy diet was followed in 20 cases. Alkalies were used sparingly; in fact, when symptoms were controlled by the diet no alkalies were given.

On discharge from the hospital each patient was given a dietary, including a list of foods to avoid. General instructions as to rest, exercise, regulation of bowels, were included. When these patients returned to the clinic many of them said that they had not followed any special diet, but on careful enquiry we found they had avoided raw fruits, raw vegetables, fried foods, etc. In fact, they had followed a careful regimen. Again, there were other patients who had apparently disregarded diet and yet were symptom-free.

SUMMARY

A report of 40 cases of gastric ulcer. The average age was fifty-five. The usual duration of symptoms was thirteen and a half years.

The majority of cases have been under observation for five years or more.

Thirty-three out of 40 patients have been free of symptoms for approximately five years.

Seven patients had symptoms suggestive of gastric ulcer, but only 3 had x-ray evidence of an active gastric ulcer.

Twenty were treated with the duodenal tube, and 20 with a modified Sippy diet.

The study of these cases suggests that patients of fifty years or over with active gastric ulcer are generally successfully treated under a medical regimen.

We are indebted to Dr. F. W. Rolph for three cases included in this series. We are under special obligation to Dr. A. C. Singleton, of the X-ray Department of the Toronto General Hospital, who personally carried out a very careful radiological investigation in every case.

METASTASIS AND METASTASES*

BY EGERTON L. POPE

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THE sparsity of reference to this subject in the sphere of internal medicine and its literature makes it almost presumptuous if not actually felonious for a physician to bring forward a topic that is so traditionally surgical. Nevertheless, if account be taken of the varied clinical pictures to which metastasis gives rise it will be realized that it possesses a very important terrain in medicine.

DEFINITION

In considering the subject of metastasis it is important to adopt some sort of definition lest we find ourselves too deeply involved in the broader subject of the systemic dissemination of disease agents and disease processes. It may not be unjustifiable to state that the term metastasis is sometimes loosely employed in this respect.

Etymologically, the term metastasis is in

reality a Greek word, *μετάστασις*, meaning (1) a removal from one place to another; (2) a changing or change; (3) a change of political constitution or revolution. Fortunately for the physician, its application in medicine is restricted to the first interpretation without economic or other unscientific reactions. According to Rose and Carless the term metastasis is an old fashioned name for the transference of acute inflammatory foci from one place to another, and the use of the term should be restricted to the remote transference episodes of mumps. They imply that the proper term is "embolism". Medical literature however, has not taken this stand and the subject can only be pursued under the old name. It is analogous to the retention of the term "typhoid" in place of the more scientific "enteric". The medical dictionaries define metastasis as "the transfer of a diseased process from a primary focus to a distant one by the conveyance of the causal

* A paper read at the Sixty-eighth Annual Meeting of the Canadian Medical Association, Section of Medicine, Ottawa, June 23, 1937.

agents through the blood vessels or lymph-channels." This definition suffices admirably for a generalization of the concept.

THE BIOMECHANISM OF METASTASIS AND IMMUNITY

Disease processes may be carried from a local lesion by the arteries, the veins, or the lymphatics to proximal or so-called regional areas and to distal remote areas. The causal agents that are so conveyed are either infective or neoplastic. Of the infective agents, bacteria, protozoa and fungi are those most commonly coming within the application of the term. Of the neoplastic agents, the malignant growths have special metastatic propensities. Given a point of entrance or development, these agents may or may not be transmitted to one or several other tissues. The determining factor would appear to be the degree of immunity or vulnerability of the host, even in the case of the neoplastic. The process of metastasis, therefore, seems to suggest one common relationship between infection and neoplasia as belligerent allies.

SITES OF ELECTION

There are some tissues which are the commoner sites of metastatic deposits. These include the pulmonary, the circulatory, the alimentary, the renal, the osseous, the neural, and the dermal. This fact applies in a general way to both the infective and the neoplastic causal agents. The organs most frequently attacked are the lungs, the heart and the blood vessels, the liver, the spleen, the kidneys, the bones and joints, the brain, and the subcutaneous tissues. Less frequently the pancreas, adrenals, and ureters may share in the process. Depending upon the tissue harbouring the original focus of a causal agent, metastases have predilections for certain organs, though not to the degree of exclusive specificity. The most that can be said is that, given a metastasizing lesion in a certain tissue, the metastatic deposition favours a peculiarly related organ or tissue but is not necessarily limited to it.

As an aid to synthesizing the subject it may be borne in mind that there are three vascular areas involved, (1) the systemic; (2) the pulmonary, and (3) the portal. The accompanying table, from Gibson, may be of assistance in visualizing metastatic predilection in a general way.

TABLE I.

Primary lesion	Metastatic lesion
1. Systemic	Pulmonary (systemic)
2. Pulmonary	Systemic (pulmonary)
3. Portal	Portal {pulmonary systemic

In a word, general hæmic invasion may result from a primary lesion in any of these areas. Not infrequently general hæmic invasion may exist without a demonstrable primary lesion—the so-called cryptogenetic type. On rare occasions even the autopsy table fails to reveal the primary focus, in spite of the revelation of widely disseminated metastases and their effects.

INFECTIONS AND METASTASES

The infections of the septicæmic type are the most important in this respect. These include:

1. Coccal: (staphylococcus; streptococcus; pneumococcus; meningococcus).
2. Bacillary: (typhoid fever; tuberculosis; *B. coli*).
3. Protozoan: (syphilis; amœbiasis).
4. Fungus: (actinomycosis).
5. Undetermined: (as in parotitis epidemica).

Indeed, there are few if any blood infections that do not show metastatic phenomena in some form. In the last analysis even the typical skin rashes of the exanthemata may be regarded as metastatic.

The common origin of infective metastases is a localized thrombo-phlebitis (primary lesion). Such a primary lesion is necessarily one involving the respiratory, alimentary or dermal tissues, that is, the tissues that are specially exposed to bacterial contacts. From this emboli are discharged into the venous circulation and most commonly find their way to the lungs *via* the pulmonary arteries, where the process of infarction or abscess formation is established. Nevertheless, the pulmonary capillary vessels may carry infective emboli away from the pulmonary to the systemic circulatory system by the pulmonary veins, traversing the left heart and onwards, to set up infarcts or abscesses in any of the viscera without fear or favour. It is for this reason that in the event of the heart valves becoming infected, it is the left side of the heart that is usually involved. From these valves—the mitral and the aortic—emboli are carried most often to the spleen, kidneys and brain, causing corresponding symptoms of painful splenomegaly, hæmaturia, pyuria, and hæmiplegia. Less frequently perhaps, minute emboli

are carried to the superficial vessels of the skin where they produce petechiæ; to the subcutaneous tissues, constituting purpuric episodes; to the muscles, with painful myositis or muscle abscess; to the myocardium, with coronary embolism; to the bones, with osteomyelitis; or to the intestines, with colic and melæna, simulating numerous abdominal conditions that are difficult to differentiate. The serous tissues, too, are susceptible to such embolic episodes, the pleura, the pericardium, the peritoneum, the joints, and the meninges. The corresponding clinical pictures are pleurisy and pleural effusion, pericarditis with or without effusion, peritonitis, arthritis, and meningitis. It is difficult to comprehend the subtle predilection of the metastases of mumps for the gonadal glands, and, rarely, for the pancreas.

NEOPLASIA AND METASTASIS

The formation of metastases in the case of neoplasia is said to have two phases: (1) the penetration of the endothelium of the lymph channels or blood vessels by the cells of the primary tumour; (2) the conveyance of tumour cells by this means to remote tissues, where they become arrested and lead to a new vascularization which establishes the secondary or metastatic growth.

By experimentation it has been found that rapidly growing primary tumours are much more effective in the establishment of secondaries than are those of more tardy development. Further study indicates that the failure of tumour cells to invade the vascular endothelium is associated with a process of vacuolation which leads to their rapid disintegration. Metastatic deposits of sarcoma of luxuriant growth are found to be associated with less tendency to vacuolation and greater tendency to vascularization by the vasa vasorum when the lumen of a vessel becomes filled. In other words, "the property of the cells which favours metastasis is a capacity for rapid growth leading to organic union with the vessel wall before vacuolation occurs".

In general it is stated that carcinoma tends to be disseminated by the lymph channels, while sarcoma tends to be carried by the blood-vessels.

In the matter of neoplastic dissemination there is perhaps less anatomical rationale than in the case of the infections. The reason for this is claimed by the pathologists to be what they

call the principles of "circuitous" or "retrograde" metastasis. Lymph-channels having become diseased and therefore obstructed, new anastomotic channels are established, and in the process of making detours unusual tissues become affected. Christopher, of Evanston, states that "retrograde metastasis is one of the most important of all the pathologic processes controlling the distribution of cancer".

A study of the location and frequency of cancerous metastases in 10,130 deceased patients by the late John B. Murphy showed these very interesting figures:

TABLE II.

<i>Carcinoma of</i>	<i>Cases</i>	<i>No. with metastases</i>	<i>No. without metastases</i>	<i>Not stated</i>
Breast	3,000	1,779	349 (11.6%)	872
Stomach	2,856	1,664	678 (23.7%)	514
Uterus	1,626	655	679 (41.7%)	292
Esophagus ..	660	560	95 (14.3%)	5
Kidney	579	219	64 (11.0%)	296
Tongue	241	185	15 (6.2%)	41
Liver	227	39	9 (3.9%)	179
Prostate	179	31	4 (2.2%)	144
Ovary	160	29	5 (3.1%)	126
Gall bladder..	136	106	16 (11.7%)	14
Rectum	135	75	30 (22.2%)	30
Bladder	122	23	11 (9.0%)	88
Pancreas	109	78	13 (11.9%)	18
Lungs	95	67	9 (9.4%)	19
Large intestine	90	33	33 (36.6%)	24
Thyroid	57	3	3 (5.2%)	51
Lips	38	10	24 (63.1%)	4
	10,310	5,556 (53.8%)	2,037 (19.7%)	2,717 (26.0%)

(Murphy)

Surveying this list, deducting the 26 per cent of cases in which metastatic formation is not stated, we find the following record of metastaphilous forms of cancer in their order of precedence.

TABLE III.

	<i>Percentage</i>
Tongue	92
Prostate }	88
Lungs }	87
Gall bladder	86
Pancreas	85
Ovary }	84
Esophagus }	81
Breast	77
Liver	71
Kidney	68
Stomach }	68
Rectum }	68
Bladder	50
Large intestine }	50
Uterus }	50
Thyroid }	30
Lips	30

These are startling figures and suggest that cancer, like septicæmia, is a constitutional disease, that a want of immunity predisposes to the formation of the primary lesion as a result of trauma or irritation and to the metastatic episodes that follow in its train. Just as we may think of typhoid fever and pneumonia as septicæmias with elective primary lesions in the intestines and lungs, respectively, so we may well think of cancer as a neoplasmæmia with selective primary lesions in almost any of the organs in accordance with more subtle, more confusing, and less precise elective processes.

SITES OF ELECTION

Statistics vary in relation to this phase of the subject. In the more common forms of cancer the preponderating tendencies of widespread metastasophilia appear to be these:

Mammary cancer.—(1) Regional lymph-nodes; (2) lungs and mediastinum; (3) liver; (4) bones; (5) brain.

Gastric, colon and rectal cancer.—Regional lymph-nodes; (2) liver; (3) lungs; (4) peritoneum; (5) bones.

Uterine cancer.—(1) Regional lymph-nodes, (a) lumbar, (b) retroperitoneal, (c) inguinal; (2) liver; (3) bones.

Kidney cancer (hypernephroma).—(1) Lungs; (2) bones; (3) liver; (4) intestine; (5) retroperitoneal lymph-nodes; (6) skin.

Prostatic cancer.—(1) Regional lymph-nodes; (2) remote lymph-nodes; (3) bones; (4) liver; (5) lungs; (6) spinal cord.

Lung cancer.—(1) Mediastinal nodes; (2) liver; (3) mesenteric and retroperitoneal lymph-nodes; (4) brain; (5) bones.

Thyroid cancer.—(1) Regional tissues undergo early invasion; (2) bones, especially of cranium.

Thyroid cancer is rare. Metastatic lesions may dominate the picture, and the patient may not be aware of any thyroid lesion. Alfred Haas, of Munich, states that "carcinoma of the thyroid has one important characteristic which distinguishes it from carcinoma elsewhere; it

relatively seldom gives rise to metastases in the lymphatic system, but frequently the large thin-walled veins on the surface of the goitre are invaded and dissemination takes place by the blood-stream." The most frequent sites of metastases are the bones, as commonly as in the case of the prostate. The order of frequency is skull, spine, sternum, humerus, femur, ribs, pelvis, clavicles, jaw, radius, os calcis. Visceral metastases occur in the lungs, liver, brain.

SPECIAL TYPES OF METASTATIC NEOPLASMS

1. *Angio-endothelioma and diffuse endothelioma of bone* (malignant bone aneurysm).

2. *Melanoma* (melanotic sarcoma).—Metastases are selective of skin, lungs, liver, kidney, brain, *et al.*

3. *Hypernephroma* (Grawitz).—Predilection for widespread dissemination in the bones.

4. *Wilm's mixed tumour of the kidney* (embryoma).—(Leiomyosarcoma, rhabdomyosarcoma, myxosarcoma, chondrosarcoma, adenocarcinoma, teratoma, dermoid, etc.). Metastases only occur when sarcomatous or cancerous degeneration occurs (25 per cent).

5. *Ewing's tumour* (endotheliomyeloma); diffuse endothelioma of bone.—Early and extensive metastases prevent a cure, although the tumour is radiosensitive.

Metastases are characteristic also of certain diseases with neoplastic propensities: (1) multiple myeloma; (2) lymphoblastoma: (a) Hodgkin's disease(?), (b) lymphosarcoma, (c) the leukæmias.

The pathology of multiple myeloma is controversial, but the characteristic tumours in the bones are regarded as primary in the flat bones containing red marrow. Metastases, though not part of the disease, may be found in the intrathoracic and intra-abdominal viscera.

The pathology of Hodgkin's disease is still too wrapt in mystery for one to be able to distinguish the primary from the metastatic aspects of the disease. Suffice it to say that, while the primary process is located in the reticulo-endothelial system, there may be a very generalized invasion of visceral and osseous tissues which not infrequently causes clinical confusion with other metastatic diseases.

The lesions of lymphosarcoma, while occupying sites similar to those of lymphadenoma, are distinguishable histologically in biopsies as homogeneous, in contrast with the heterogene-

TABLE IV.

UNIVERSITY OF ALBERTA HOSPITAL

Analysis of 60 cases of carcinoma of the breast with metastases.

(1) Axillary node metastases without others.....	30
(2) Axillary node metastases with others.....	30
(a) Cervical nodes (one with brachial plexus and sympathetic involvement).....	2
(b) Mediastinal nodes	2
(c) Lungs	7
(d) Lungs and bones (one with spontaneous fracture)	3
(e) Bones (three with spontaneous fracture; one with paraplegia).....	8
(f) Liver	3
(g) Liver and brain.....	1

ous process of Hodgkin's disease. The metastatic aspect is similar in the two diseases, in that remote organs may be invaded and a confusing picture is thus established.

The pathology of leukaemia is characteristic in the lymph-gland involvement taking the form of discrete and smaller tumours than in Hodgkin's disease or lymphosarcoma. Histologically, the lymph glands are stuffed with lymphocytes or myelocytes, according to type. Embolic phenomena in the lungs, brain, or heart give the disease a metastatic status.

THE DIAGNOSIS OF METASTASES

The metastatic problem in internal medicine is referable for the most part to the viscera though not entirely. The systems invaded by metastases that cause obscure diagnostic problems are: (1) the intrathoracic; (2) the intra-abdominal; (3) the nervous; (4) the locomotor.

Chest conditions with symptoms of (1) cough, at first dry and unproductive, later associated with expectoration of tough stringy mucus, blood, or perhaps pus if secondary abscess has evolved; (2) unilateral or bilateral pains in the chest of progressive course; (3) shortness of breath; (4) distension of superficial veins and cyanosis of the upper part of the trunk; (5) pleural effusion, usually hæmorrhagic, recurring with striking rapidity after thoracentesis; should suggest the possibility of metastasis, and x-ray examination of the lungs. The radiogram is quite characteristic. The sources of origin then should be considered and a careful clinical scrutiny of the elective organs made, notably the breast, the prostate, the adrenals and kidneys, the stomach and the uterus.

The *intra-abdominal conditions* associated with nodular painless enlargement of the liver, with or without palpable tumour in the stomach, colon, or rectum; digestive disturbances, anæmia, fever, and slight icteroid phenomena, should suggest an alimentary cancerous lesion. The usual clinical investigations of gastric contents, stools, microscopic examination of ascitic fluid, barium series and barium enema will usually lead negatively or positively to enlightening conclusions, if not an exact anatomical diagnosis. If the alimentary system cannot be found to be primarily culpable, the examiner must go farther afield and think of possibilities in the breast, the uterus, the prostate, and the lung,

even in the absence of symptoms referable to these organs.

Neurological conditions such as gradually evolving hemiplegia, monoplegia, and paraplegia, cranial nerve palsies, spinal root pains, segmental sensory aberrations, epileptiform attacks, headaches, vomiting, personality changes, visual disturbances, and even hysteria, can hardly fail to suggest intra-cranial or intra-spinal tumour formation. If these be not clear-cut syndromes characteristic of the vascular accidents, metastatic involvement must be suspected, and a clinical tour of inspection made in the lungs, the breasts, the alimentary canal, and the genito-urinary organs, in search of the primary focus.

Locomotor conditions.—Of the locomotor tissues the bones are predominantly invaded by metastases. In skeletal invasion the symptoms vary according to the bones chiefly involved. In cranial bone invasion head pains are suggestive. In one case observed the first symptom to lead to medical attention was an extensive hæmorrhage under the scalp due to metastatic erosion of a localized portion of the calvarium.

In the thorax osseous involvement is most commonly expressed in spontaneous fracture of ribs from minor traumata such as coughing, twisting, or insignificant pressure.

In the spine metastases may cause root-pains, girdle-pains, monoplegias, paraplegias, paræsthesias of varying types, bladder and rectal symptoms.

In the pelvis pains and discomforts, variously regarded as sacroiliac disease or subluxation, lumbago, sciatica and lumbo-sacral strain, may lead to prolonged and useless physiotherapy.

In the extremities pains leading to a diagnosis of neuritis, or a spontaneous pathological fracture from minor trauma or strain attended with malunion, may be the first clinical manifestation of metastatic dissemination.

PROGNOSIS

The prognosis of metastatic episodes in infections is largely dependent upon the site of invasion. Metastatic episodes occurring in vulnerable points in the brain, lungs and heart may cause either a rapidly fatal issue, or a permanent disablement. Areas of less vital importance may recover without much clinical stress.

In metastatic carcinoma and sarcoma, however, the outlook is notoriously bad. Neverthe-

less there are certain features that are subject to alleviation at least.

TREATMENT

Treatment of neoplastic metastases by deep x-ray in many cases offers prospects of temporary control, alleviation of pain and misery, and prolongation of life. Metastatic growths may be reduced sometimes in a quite dramatic manner. A single osseous deposit causing spontaneous fracture may respond to x-ray therapy, and union of the fracture may be made *a fait accompli* with good restoration of function. A metastatic deposit may lead to an emergency condition in which radical operative procedure is not only justified but imperative to prevent an untimely and distressing form of fatal termination.

CONCLUSIONS

The study of metastatic processes leads to a number of important deductions.

1. The discovery of a cancerous growth or suspected cancer demands a careful general examination by an internist before the patient is taken to the operating table. A thorough subjective investigation is in order, as from this a clue to systemic dissemination may be gleaned, and routine radiological studies of the thorax and skeletal tissues may be conclusive evidence that a radical operation on the primary growth is superfluous, if not actually contraindicated.

The cranium, the spine, and the pelvis are to be regarded especially important as selective sites of many metastatic tumours.

2. The presence of metastases thus discovered is not necessarily a contraindication for surgery. Emergency procedures such as those for relief of bowel or urinary obstruction may save and prolong life in the face of progressive metastasis. They may restore a measure of comfort that is most acceptable to the patient and therefore justifiable.

3. X-ray therapy is a valuable adjunct to the treatment of cancer even in inoperable cases. It is certainly indicated as a follow up procedure in cases where operation offers a reasonable prospect of eradicating a localized growth.

4. Patients in the adult period presenting themselves with ill defined symptoms and bizarre syndromes should be investigated from the angle of metastatic processes. Cancerous activities may thus be determined when no localized lesion is demonstrable. An example of this was seen in a man who died of disseminated cancer and at autopsy the primary site was found only when careful microscopic studies of an apparently normal prostate were pursued.

5. A study of the cases of metastatic cancer admitted to the University Hospital, Edmonton, shows a deplorable tendency on the part of the public to procrastinate in the matter of seeking expert advice in the early stages of cancer.

DIAGNOSIS AND PALLIATIVE TREATMENT OF TRIFACIAL NEURALGIA

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"TRIFACIAL neuralgia", "trigeminal neuralgia", and "tic douloureux" are the terms used to designate a pathological condition of the fifth cranial nerve tract characterized by extreme pain of paroxysmal type. Trifacial neuralgia has been known since the middle ages. In 1773 Fothergill¹ described the disease as "A painful affection of the face". Many others have contributed to the treatment since that time.

Trifacial neuralgia, while not a common disease, is the most important of the various types of neuralgias, and probably is associated with the most excruciating type of pain known.

Many cases of this disease go unrecognized for considerable periods of time. As the majority of patients suffering from pain in the region of the face are found to have defective teeth they invariably consult their dentist before their physician. It thus behooves a dentist to be acquainted with the symptoms of trifacial neuralgia which are so distinctly different from those of the usual neuralgia of the face caused by dental caries, impacted teeth, degenerating pulps, pulp stones and sinus infections. If a person has once seen a patient suffering from an attack of this disease he will never forget it.

Etiology.—The specific etiology of trifacial neuralgia is still unknown. Most writers in the past have felt that it was caused by a pathological condition within the Gasserian ganglion, but pathologists have been unable to demonstrate any specific pathological changes. Adson² is inclined to believe that the cause of this disease may be of central origin and that the palliative and radical treatment does nothing more than to interrupt the sensory reflex.

Symptoms.—Trifacial neuralgia is characterized by a sharp, sudden, severe, agonizing, shooting pain extending along the ramifications of one or more of the branches of the fifth nerve which is not controllable by any sedative. The attacks are brought on by irritation of the area involved, such as moving or touching the lips, cleansing the teeth, washing the face, eating, talking, or by sudden exposure to air or sound. During a paroxysm the patient's face may be highly flushed, and he may rub his face with sudden energy. He may often groan, and manifests an expression of extreme agony. When the maxillary division is involved the eyes are congested, lacrimation is increased, and running of the nose is common during a spasm. Between attacks the patient often converses with lips immobile. The attacks are of short duration, lasting from a few seconds to a minute or two, and are usually followed by a period of complete relief lasting from a few minutes to several hours. The third, second and first divisions of the fifth cranial nerve is the order in which they are most frequently involved.

While trifacial neuralgia may occur in early or late life it is most common after the fourth decade. Usually only one side of the face is affected, but Adson² reports that in about 2 per cent of cases it is bilateral, with a history of more severe pain on the side on which it began. Men and women are about equally affected.

The paroxysmal pain at first may only last for a few weeks, with an interval of relief for months, but as the disease progresses the attacks are of longer duration and of greater intensity. At first the patient very often complains of the pain being localized in one or more teeth, the removal of which, however, fails to clear up the condition. On the other hand the pain may be over an antrum, the treatment of which fails to benefit the patient.

There is almost no type of therapy which has not been tried for this affliction. Adson³ points out that "One must remember that the attack may pass spontaneously into a quiescent stage, and not infrequently various types of treatment are credited with affecting relief when in reality the cessation of pain is more or less coincidental".

Differential diagnosis.—As several forms of severe facial pain exist, and since the success of the treatment depends directly on the accuracy of the diagnosis, it might be advisable to review the other lesions that cause facial pain. Migraine is easily differentiated as trifacial neuralgia is not associated with headache. In the case of sinus infection the pain is more or less constant and very often is associated with local tenderness; moreover the pain is not aggravated by external stimulation or irritation. Facial pain of definite dental origin caused by infection in or about the teeth is often throbbing but is usually more or less constant. If the pain persists pathological evidence will soon be seen in the dental radiographs, and this together with the vitality test, tenderness to percussion and sensitivity to heat or cold will clinch the diagnosis in these cases. Another important point in the case of pain from dental caries or degenerating pulp is that the pain persists after the patient retires, whereas in cases of trifacial neuralgia the pain at the onset is rarely initiated during the patient's sleep. The presence of pulp nodules may give rise to local or reflex facial pain, but here again the pain is not paroxysmal nor can it be compared with the severe pain of trifacial neuralgia.

Glossopharyngeal neuralgia is the second important primary type of neuralgia. It compares clinically with trifacial neuralgia but the pain follows the distribution of the ninth or glossopharyngeal nerve. The attacks are intermittent and paroxysmal, as in trifacial neuralgia, and occur about the same time in life. In this neuralgia the needle-like pains flash between the tonsillar fossa and the ear, and are usually brought on by swallowing, yawning, coughing, talking or laughing. The treatment is section of the ninth nerve.

Sphenopalatine neuralgia, "Meckel's tic", "Sluder's⁷ tic", is a "lower half headache", and is characterized by a persistent, boring pain situated apparently in the maxilla. Sphenopalatine neuralgia is rare compared with trifacial neuralgia, and is not usually severe enough to incapacitate the patient unless he is of a neurotic type. The diagnosis can be easily confirmed by cocaineization of the sphenopalatine ganglion.

Tumours of the Gasserian ganglion are extremely rare, and when present may produce major trigeminal pain. In such cases, however, anaesthesia of the face occurs, gradually involving the entire area of the distribution of the trigeminal nerve.

Treatment.—The only therapeutic measures known to be effective at the present are deep injections of the nerve and division of the sensory root. Schlosser,⁴ of Munich, is credited with being the first to advocate the use of alcoholic injections for treatment of this disease, and in 1903, reported a series of experiments which he had commenced in 1896. In 1898 Spiller,⁵ in collaboration with Keen, suggested section of the sensory root posterior to the ganglion, provided it could be shown that regeneration could

not take place afterwards. This procedure was first carried out by Frazier⁶ in 1900.

Palliative treatment.—During the World War a volatile drug, trichlorethylene, was discovered to have a selective effect on the sensory portion of the fifth nerve. This phenomenon led to experimentation with it as an inhalant in the treatment of trifacial neuralgia. Much was hoped for from this drug but the results have been very disappointing. In Adson's² opinion there is no specific medication of any material value, and he thinks that inhalations of trichlorethylene, thirty drops on a sponge, administered every two or three hours may minimize the symptoms of pain. Rowe⁸ reports little benefit from its use in his cases, and points out that its administration was often followed by sensations of dizziness and fullness in the head so disturbing that patients gave it up after a few trials.

Deep alcohol injection of the maxillary or mandibular nerves at their points of exit from the skull provides the most complete and effective relief of any of the various palliative measures. Superficial injection of the peripheral branches at the mental, infra-orbital and supra-orbital foramina offers slight relief. In some cases one may get an excellent result, and two of these cases will be reported below. The average period of freedom from pain following a deep injection is nine months. Frequently relief of pain is obtained from deep injection for a period of from two to three years. Benefit derived from an injection depends directly on the proximity of the deposition of the alcohol to the affected nerve. Treatment by this method does not require hospitalization, and entails neither the morbidity nor the mortality of operation. The procedure may be repeated, but subsequent injections are more difficult to make on account of scar-tissue formation, and less effective because this new tissue steadily decreases the penetration of the alcohol. Adson² does not believe an injection should be done more than three times.

Deep alcohol injection should nearly always be performed for three reasons. (1) If injection of alcohol is successful in relieving the pain the diagnosis of trifacial neuralgia is confirmed; (2) it offers temporary relief of pain to dehydrated and emaciated patients who are not good operative risks; (3) it helps to educate the

patient as it acquaints them with the numbness or "wooden" feeling which will follow section of the nerve. Deep alcohol injection is most successful where only one division is involved in the disease. It is more difficult to block the ophthalmic division, as one hesitates to inject a large amount of alcohol deep into the orbit. (I have never attempted to block this division). One may not always be successful in blocking the nerve on the first injection, but there is no contraindication against repeating the procedure in a few days' time.

Some men prefer to make the injection while the patient is in the analgesic stage of a nitrous oxide and oxygen anæsthesia. The cases which I am reporting were premedicated with morphine sulphate, gr. 1/6, and hyoscine, gr. 1/120. A small amount of novocaine was used superficially and a small amount deposited ahead of the needle as it made its way into the deep tissues. As one approaches the nerve trunk some pain is usually experienced. When the alcohol is deposited the patient has a few minutes of severe pain similar to a paroxysm. In my experience this instigation of a severe attack has been a good sign. The deep injection can be done either intra- or extra-orally. In my experience I have met with good success by injecting the third division intra-orally (foramen ovale), but have had much better success by using the extra-oral route when blocking the maxillary branch at the foramen rotundum. I have deposited up to 3 c.c. of 95 per cent alcohol in my deep injections. One must be careful not to deposit any alcohol in the muscle tissue. It has been my practice to have the patient move his eye from side to side as the alcohol is deposited to block the maxillary division. In this way one may quickly and readily see if the sixth cranial nerve is being affected, as it supplies the external rectus muscle of the eye. This latter condition is more apt to follow injections of alcohol into the Gasserian ganglion.

One meets occasionally a trifacial neuralgia with the pain starting over the infra-orbital foramen, running down into the cuspid area into the upper lip, over the side of the nose, and up over the bridge of the nose toward the forehead. I have two cases in elderly patients where I have obtained relief for them by injecting 1 c.c. of alcohol into the opening of

the infra-orbital canal. The nerve in this position is much more accessible than at the foramen rotundum. Each of these patients has had three injections. When so much fibrous tissue has formed in this area that penetration of the alcohol is interfered with one may still give these patients relief by doing the deep injection.

The infra-orbital foramen is best blocked extra-orally. Although many men shun this injection in dental practice on account of their fear of getting into the orbit by way of the canal, one has only to pass a needle through this foramen into the canal to actually learn how difficult it is to do. My practice is to inject about 1 c.c. of novocaine, and when this has taken effect, one is then able to palpate and feel for the opening with the needle. To get a successful result the needle should be just inside the canal, and 1 c.c. of alcohol is all that is necessary to deposit in this area. Alcohol has a destructive effect, especially on loose connective and nerve tissues. Skin and muscle tissues are not affected to the same extent. The pathological process is an aseptic necrosis. The necrosed tissue is replaced in time by a fibrous connective tissue. Following the injection of alcohol one may notice slight paralysis of the muscles of mastication. Motor fibres recuperate or regenerate more quickly than do the sensory ones.

The patient should always be informed that the injection of alcohol will only give temporary relief, and that a permanent cure can only be obtained by severing the sensory root of the fifth nerve within the cranium. He should also be informed that this operation when performed by an expert carries a mortality of less than 0.5 per cent and that complications are rare.

CASE 1

Mrs. V., aged 45 years, was first seen on November, 28, 1932, complaining of a hot burning, stabbing pain in the lower right jaw and lip. Her first attack had come two years previously and had felt like a toothache. She had had a molar tooth extracted but got no relief. A second molar tooth was removed, and following this she got relief until June 1, 1932, at which time the pain returned in a very severe form. In October she had three more lower teeth removed, with no relief. Attacks of pain now came at night as well as in the daytime and she was afraid to eat, sleep or talk for fear of precipitating another attack. She was continually smacking her lower right lip, and had been using oil of wintergreen on the gum but no form of medication had relieved her pain. One city hospital had made radiographs of all her teeth and reported the upper right first molar to be diseased. They had also reported

thickening of the mucous membrane of the right antrum and had advised drainage. The patient had never had a single restoration made in any of her upper teeth. In my opinion the first molar was negative in these x-ray films and tested normally for vitality. There was no clinical symptom or history of sinus infection.

I did a right mandibular injection, and deposited 4 c.c. of 2 per cent novocaine at two o'clock in the afternoon. Paroxysmal pains stopped and did not recur until eight o'clock that evening. The following day I did a deep injection extra-orally and deposited 2 c.c. of alcohol to block the mandibular nerve. The patient was greatly relieved but not completely. On December 2nd I re-injected this nerve and deposited 2 c.c. more of alcohol. The following day the patient had complete anaesthesia over the entire distribution of the mandibular branch of the fifth nerve, with complete relief of all pain and came in looking like a new person.

I removed a tooth for Mrs. V. on July 29, 1937, and she reported that she had not had an attack since being injected. She stated, however, that she had felt the pain was going to return on one or two occasions.

CASE 2

Mr. M., a farmer, aged 36, was first seen on September 24, 1935, complaining of a severe neuralgia of the upper right jaw. Six years previously he had experienced a sudden, severe, excruciating pain, which he described as a hot flame, that started in the region of the apex of the upper right cuspid tooth, travelled up toward the eye, into the side of the nose and upper lip, and back through the upper jaw to the region of the condyle. An attack lasted only a few seconds but might recur in one-half hour. However, he was usually free for a longer period of time. Between attacks he had felt fairly well. Attacks of pain lasted one week and then disappeared for six months. Mr. M. has had periodic attacks since that time. In July, 1935, the patient had a recurrence of very severe pain. Dental radiographs revealed a lower right impacted third molar. This tooth was removed, with no relief. Since that time he had been afraid to wash, shave, eat or even touch his face in case he might bring on another attack. The patient had come directly from a three weeks' stay in one of the largest city hospitals. While there his sinuses were investigated but no definite diagnosis had been made.

I did a diagnostic infra-orbital novocaine injection. Following this an attack could not be precipitated, but still he complained of some pain in the posterior part of his maxilla. He had relief for two hours. On the following day, September 25, a deep alcohol injection of the maxillary nerve was done extra-orally and 3 c.c. of alcohol deposited. He got relief immediately. The following day he said "I felt so good last night that I did not want to go to sleep and the nerve feels as if it is trying to twitch but can't".

On September 21, 1937, the patient returned. Physically he was much better, and reported that he had been able to do his work until July of this year, at which time he had a severe attack. On September 19th, after eating breakfast, he had precipitated another severe attack upon blowing his nose, and since then had had no relief. I did a deep alcohol injection extra-orally and deposited 3 c.c. of alcohol. He was completely relieved. Numbness in the nose and cheek was more profound than that following the previous injection. I again advised this patient to prepare himself for a future radical operation as I felt that only one more injection should be made.

CASE 3

Mrs. G., aged 52, was first seen on September 11, 1933, looking very haggard, and complaining of sudden, recurring, stabbing pains through the left side of the face starting at the angle of the jaw. The first attack

had come on suddenly three weeks previously. At first there were from four to five attacks a day but now they were coming much oftener. The attack that morning was so severe that she was given an injection of morphine sulphate without relief. I did a mandibular injection of 2 per cent novocaine, and following this could not precipitate another attack. The lower left second bicuspid, which was badly broken down, was removed. The patient spent a comfortable afternoon but had a recurrence of paroxysmal pain the following day. A deep injection was done intra-orally and 3 c.c. of alcohol deposited. She slept most of the day, felt, and looked much better the following day, and reported anaesthesia of the lower left lip and jaw. In September, 1937, Mrs. G. reported that she had not experienced a severe pain since the date of injection but had had slight occasional shooting pains, which however, were not serious enough to complain about.

CASE 4

Mrs. B., edentulous, aged 61, was seen on March 21, 1934. On March 6th she had gone for a car ride, and the next day at 4.00 a.m. suddenly awakened with a severe stabbing pain through the left side of her face. At 9.00 p.m. she had another attack. She tried to sleep sitting up. She had another attack at 5.00 o'clock the next morning, and was taken to hospital, where she stayed there for four days, having from three to four attacks each day. She was given morphine hypodermically but returned home with no relief. The diagnosis was trifacial neuralgia involving the second and third divisions on the left side. Her blood pressure was 208/85. The urine showed acetone and traces of sugar. The blood sugar varied from 200 to 238.

Deep alcohol injection was done, to block the second and third divisions, with partial success. This patient was injected twice more for each division before complete relief of pain was obtained. She was dismissed on April 4th, at which time she was wearing her dentures and feeling quite happy.

This is the most obstinate case that I have met with, and I include it to show that one injection does not always give the desired result. This patient on account of her hypertension and diabetes was in no condition to stand operation.

CASE 5

Mr. H., aged 77, was first seen in July, 1934, complaining of a very severe shooting pain which started in the infra-orbital region, passed down into the cuspid area, over the side of the nose, and up over the bridge of the nose into the forehead on the left side. The left eye was markedly congested and the face flushed. During an attack the tears poured out of his left eye. He stated that he had tried everything but had obtained no relief. This patient was edentulous. His pain had

started more than a year previously, and his attacks of pain were then so bad that he had trouble eating, shaving, talking and washing his face. I did an infra-orbital injection extra-orally, and deposited 1 c.c. of alcohol, which gave him relief for approximately one year. I re-injected him in July, 1935, and he was free until the end of November, 1936. I again injected him on January 18th of this year, depositing 2 c.c. of alcohol. This man is now eighty years of age. It is my opinion that one is warranted in re-injecting a case of this kind as long as one can obtain a good result.

CASE 6

Mrs. B., aged 65, was first seen in July, 1935, suffering from a severe trifacial neuralgia involving the terminal branches of the infra-orbital nerve. One c.c. of alcohol deposited just inside the infra-orbital foramen gave her relief until July, 1936. She was again injected and given relief until March, 1937. At this time I re-injected and deposited 2 c.c. of alcohol, and she has been free from her pain since that time.

SUMMARY

1. Trigeminal neuralgia is characterized by paroxysmal attacks of excruciating facial pain, aggravated by contact or motion and not relieved by any ordinary medication.
2. The only satisfactory measure to relieve this pain is deep injection of the nerve with alcohol. The only permanent relief is section of the sensory root.
3. If the diagnosis is doubtful the injection of novocaine will verify it.

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CHRONIC PORTAL OBSTRUCTION.—V. Lozzi after an allusion to the non-success of the usual surgical treatment of ascites in hepatic cirrhosis, considers the various venous anastomoses which have been effected. He remarks that Rosenstein's union of the inferior vena cava and the portal vein demands virtuosity even in a surgeon experienced in vascular operations, and regrets that anastomosis between the superior mesenteric and portal veins, as done by Bogoraz in 1912 and Krestowski in 1926, has not more often been tried. He has found that such a union remained pervious in seven out of ten dogs. The same operation has been done on an alcoholic sub-

ject, aged 49, with hepatic cirrhosis, and in a woman, aged 26, with portal thrombosis. Both made good recoveries, and the rate of accumulation of ascitic fluid was afterwards considerably less. Lozzi prefers a lateral anastomosis to the termino-lateral union made by the others, and regards a stoma of at least 15 mm. in diameter as essential. A less drastic proceeding proposed by the author is anastomosis of a radicle of the inferior mesenteric vein or of the ileo-colic vein with an iliac vein; this method was tried by Ghiron without success.—*Rinasc. med.*, June 15, 1937, p. 371. Abs. in *Brit. M. J.*

THE PROBLEM OF THE DEAF CHILD*

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THE deaf in Canada are almost a neglected section of the population. In England there has been a growing appreciation of the extent to which impairment of hearing has become an economic factor and handicap; there is government recognition and provision for the deaf of all ages and conditions; accurate information is available under the auspices of a National Institute for the Deaf, so that all concerned can receive information regarding diagnostic clinics, places for treatment, and schools for education; last and not least a serious attempt is made to prevent the exploitation of the deaf. The United States too has awakened to the importance of what is now recognized as a great national problem; great surveys are being undertaken and one of the best of these stated some years ago that there were approximately 45,000 deaf mutes, 3,000,000 children with sub-normal hearing, and over 10,000,000 persons with some defect in hearing in the United States. In Canada there are a few schools for the education of the hopelessly deaf. Apart from the information available at these institutions there is practically no knowledge of the number of deaf and the severity of the deafness, and no attempt is made to help the deaf in their search for improvement or employment, and none at all to prevent their exploitation.

Deafness is a condition in which the pædiatrician should be vitally interested but in which he has up to now displayed little interest, essentially because of his lack of appreciation of its importance. Deafness is either congenital or acquired. By far the greater part of the latter comes on during childhood, and the beginning of the remainder of deafness has its origin in childhood. Deafness, therefore, presents a challenge to the pædiatrician.

The information in this paper has been gathered from many trustworthy sources, and is an attempt to bring together for the information and interest of the pædiatrician a summary of

the facts and ideas regarding deafness which may prove of help to him in practice. The subjects discussed are the causes of deafness; how the different types of deafness are recognized; what can be done for deafness; what can be done to prevent deafness; and, finally, what is being attempted by way of investigation of the great problem.

THE HEARING MECHANISM

From the physiological point of view the organ of hearing consists of two parts; first, the sound-conducting part, which includes the external, middle and part of the internal ear, and, second, the sound-perceiving part, which includes the organ of Corti, part of the auditory nerve, and the auditory centres in the brain. The first of these is the mechanism for collecting the sound impulses that originate in the outer air and for bringing them into contact with the terminal apparatus of the nerve of hearing. The second of these is the mechanism for transforming these physical sound waves into nerve impulses and for conducting them to the cortex of the brain where the actual perception of sound takes place. Defects in hearing caused by changes in the first of these are called obstruction or conduction deafness, and defects in hearing that are due to impairment of the nervous mechanism are called nerve deafness or perception deafness.

Few medical men are aware that up to 1926 practically nothing was known of the physiological function of the ear. The Helmholtz and other theories of hearing are based almost entirely on the anatomical and histological structure of the ear, and are, therefore, theoretical. This deplorable lack of knowledge was due to the fact that there was no satisfactory method for the study of the physiology of the ear. In 1923 accurate measurements of hearing by mechanical means became available for the first time, through the simplification and perfection of the electric audiometer by the Bell Telephone Laboratory. In April, 1930, Wever and Bray, of Princeton University, discovered the first

* Read on June 11, 1937, at the Meeting of the Canadian Society for the Study of Diseases of Children at Niagara Falls, Ont.

physiological method for the study of the organ of hearing. This invention and this discovery have marked an epoch in otology, and are the basis of a vast amount of research now going on in physiological laboratories all over the world, and the information already obtained has modified our knowledge and treatment.

THE CAUSES OF DEAFNESS

Some deafness is congenital in origin, and a serious form of deafness, oto-sclerosis, is also congenital, in that the tendency to it is inherited. Some deafness is due to errors in development. This error may affect any one or more parts of the conduction mechanism or of the perception mechanism. It is known that these developmental defects rarely involve both the external and inner ear simultaneously.

Many physicians have seen children with small, or multiple auricles, or with atresia of the external canal. The anomaly may be bilateral, but the internal ear in these children is usually quite normal, and consequently there is little justification for surgical interference, at least so far as improvement of the hearing is concerned.

When the error in development affects the internal ear a variety of serious conditions may be present. Malformation of the bony and membranous labyrinth, absence or maldevelopment of the organ of Corti, malformation affecting both the cochlear and vestibular apparatus, maldevelopment of the spiral ganglion, are a few of the conditions that have been discovered by histological section. There are also possible abnormalities of the 8th nerve and of its intracranial connections, and of the auditory cortex, but of these nothing is known.

Another form of congenital deafness is that called the endemic form and associated with cretinism. The vestibular apparatus is usually normal, but the middle ear spaces are filled up by a myxomatous thickening of the submucous tissues, often filling up the niches of the windows. Many cretinic deaf mutes are really only hard of hearing.

Oto-sclerosis is a peculiar condition. It is a disease of adult life and shows itself as a patch of peculiarly staining spongy bone in the hard bone which surrounds the cochlea. The same type of bone change is not found in any other bone in the body. It may occur in many places in the hard bone surrounding the cochlea. Un-

less it involves the stapes it does not affect the hearing. In one instance three foci of oto-sclerosis were found in the left ear, in which there was deafness; but in the other ear, which had normal hearing, there were *four* foci of oto-sclerosis, one of which was in the typical site but had not actually invaded the stapes. Deafness in oto-sclerotics has been known to vary, and the explanation is given that the variation is due to the alternation of decalcification with re-deposition of calcium, but the greater the deposition of calcium, the firmer does the footplate of the stapes become ankylosed, and in consequence the deafness becomes greater and more firmly established.

Nearly all the remaining deafness can be classified under the heading "acquired" and is due in some form or another to inflammation. The earlier and the more severely these inflammatory conditions occur, the greater the tendency to deaf-mutism. Deaf-mutism rarely results unless the injury to the labyrinth has occurred in the first ten years of life. One of these injuries is trauma at birth. Fracture of the cranial base has been known to involve both internal ears. In other instances where the head of the newborn was traumatized, but less severely, hæmorrhage has been found all through the cochlea.

For the rest, acquired deafness is the result of infection, and, in the main, of infection in childhood. Reliable statistics show that when deafness in children was acquired 61.7 per cent had become deaf by the third year of life; by the fifth year 78.8 per cent had become deaf; and in only 10.4 per cent did deafness develop between the ages of five and ten. This acquired deafness of childhood is due to an infection of the middle ear, or to a toxic neuritis of the internal ear, or to both. Meningitis in infancy is the most prolific cause of acquired severe deafness; measles is next; scarlet fever next; and influenza next. Syphilis used to be considered a prolific source of congenital deaf-mutism, but its importance probably varies in different countries. In one public institution for the deaf in the United States 400 children were examined and only two had a positive Wassermann reaction. So that in parts of the United States, at any rate, syphilis does not appear to be an important factor in the etiology of severe deafness in children.

Deafness in the *external ear* can be caused by plugs of wax, boils in the canal of the ear, and myringitis.

Middle ear deafness is the result of lesions in the middle ear which have their origin in inflammatory processes originating in the nasopharynx. Examples of the lesions produced are: fluid in the middle ear, thickening of the mucous membrane lining of the middle ear, ankylosis of the joints between the ossicles, particularly ankylosis of the footplate of the stapes in the oval window; adhesions or abnormal masses of fibrous connective tissue blocking such places as the round window or impeding the action of the ossicles; impairment of action of the muscles; blockage of the Eustachian tube by a plug, by swelling of the lining, or by impaired lymphatic drainage. These impair the normal action of the middle ear mechanism. It has been shown experimentally that extreme tension of the tensor tympani muscle produces a fixation of the ossicular chain, and the transmission of low tones may be reduced until they are no longer audible.

Internal ear deafness is caused by such lesions as loss of the outer air cells of the organ of Corti; atrophy or swelling of parts of the organ of Corti; hæmorrhage in the organ of Corti, or in any one or more of the main compartments of the internal ear; degeneration of the spiral ganglion; degeneration of the spiral nerve; deposition of bone in any part of the internal ear.

The internal ear is set in the stony-hard petrous bone, and inside this is surrounded by a further layer of extremely compact bone. It is therefore relatively invulnerable to direct attack. It can, however, be reached through the blood stream, through the auditory nerve, and through the round and oval windows. The internal ear is known to be susceptible to certain drugs, prominent among which is quinine. It is extremely likely that nearly all of the degenerative changes produced in the internal ear are a result of a toxic neuritis produced by toxins reaching it from the blood stream (such as the toxin of scarlet fever and even diphtheria) because in many instances of severe deafness following the exanthemata there has been no otitis media. Meningitis produces similar degenerative changes in the nerve structures, probably by direct invasion through the cribriform plate at the outer end of the internal auditory meatus.

Deafness from lesions in the *auditory nerve* may be due to tumours from small to large in the internal auditory meatus, or abnormalities of the 8th nerve such as produce the so-called Menière's symptom-complex.

Very little is known regarding deafness due to lesions on the *intra-cranial connection or on the cortex*, but in regard to the latter an interesting observation has recently been made. It is taught that the acoustic centre of hearing is in the temporo-sphenoidal lobe of the dominant half of the brain. It has been shown, however, that there is no practical impairment of hearing in a right-handed person when the left temporo-sphenoidal lobe has been removed, and vice versa. Dandy has recently presented some evidence, following extensive brain surgery, which suggests that this localization in the temporo-sphenoidal lobe has been erroneous and that the cortical centre of hearing is probably in the left parietal cortex.

HOW DIFFERENT TYPES OF DEAFNESS ARE RECOGNIZED

Deafness is difficult to detect in infancy, but at four months old an infant should recognize the human voice. Whenever there is a family history of deafness, deafness in the infant should be strenuously watched for. The earlier the defect can be discovered the better. It frequently escapes detection until the parents or the nurse notice that the child does not learn to speak at two years of age. The pædiatrician's problem is then to decide whether he has to deal with a very backward child or a true deaf mute. If the young child is lively and intelligent and clever with its hands it is not likely that it is dull in intellect. If, therefore, such a child takes no notice of the sounds around about it, it is because it is deaf. On the other hand, if the child does not smile when spoken to, and takes little notice of the things it plays with or the sounds around about, the apparent deafness is likely due to lack of intellect.

Make enquiry regarding consanguinity and a family history of deafness, and ask if the parents think the child heard some months previously. When deafness is suspected thorough inspection of the ear drums is called for. In small canals pads of wax or epithelial débris are easily overlooked. The external ear should be thoroughly cleaned. Impairment of function of the Eustachian tube can result in accentuation of the

concavity of the drum, shown by prominence of the short process of the malleus and an indrawing of the handle of the malleus, so that it may look extremely short. More marked changes in the drum, such as thickening, inflammation, perforation, discharge, clinch a diagnosis of otitis media and call for the attention of an ear specialist. You are probably aware that marked changes in the drum membrane may be found with normal hearing. On the other hand what appear to be slight alterations in the appearance of the drum membrane may often signify adhesions in the middle ear. Such are to be referred to the otologist. The deafness produced by these is not progressive unless there are recurring attacks of acute suppurative otitis media.

The degree of deafness is often a reliable guide to the part of the organ of hearing at fault; very severe deafness cannot be produced by alteration in the sound conducting mechanism alone, while moderate defects of hearing may be. When deafness is suspected in the young child be on the outlook for simulation. The occasional child will feign deafness for its own convenience.

The young child suspected of deafness in rare instances cannot speak any words, in other cases it can say a few words such as "Mum" and "Dada". Such words are not, as the parents fondly believe, proof that the child has useful hearing; they are often picked up from imitation by close observation of the lips. Sometimes such words or sentences were learnt before the child acquired its severe deafness. So, the mere saying of words is not of paramount importance in diagnosis. What is of importance is the inflection and intonation of the words uttered. If they are flat and toneless the deafness may prove of the severest, but if they are reasonably modulated there is probably a remnant of hearing which can be used. The parents and school teacher should be advised that every child who requires to be told a thing twice should be examined by an ear specialist. The trouble may not be inattention, it may be deafness.

The child should be tested in many ways and in a natural friendly manner and with familiar sounds. A bell can be rung or a whistle blown or the hands clapped. Ingenuity is required. The same child is capable of saying that he doesn't hear a watch placed in contact with his ear and yet of telling you that he does hear it quite distinctly when it is hidden in your pocket.

All examinations should be short. The main point is not to fatigue the child's attention.

The younger the child, the more difficult the determination of the presence of deafness. Having, however, made the diagnosis that there is real deafness present, the child should be sent to an otologist for differential diagnosis. He will return a reply that the child is feigning deafness, has slight, moderate, severe or extreme deafness, and will make certain recommendations which should be carried out. Do not expect him to make a diagnosis of otosclerosis, as a young house physician recently did for me. Otosclerosis is the greatest single problem in otology. Few otologists will venture this diagnosis before the age of twenty, and some take the attitude that it is undiagnosable with certainty during life.

The otologist will test the hearing in many ways, notably, by audiometers. It is commonly written that defects of hearing can be accurately determined by employing simple voice tests. This, however, is a legacy from the past. Voice tests of hearing of all sorts have been demonstrated to be unreliable as means of judging improvements or retrogressions in hearing. They vary with the state of mind and of liver of the examiner. They are particularly to be mistrusted when they are performed by a physician eager to demonstrate an improvement from his treatments.

The otologist will perform a caloric test with the head 60° back. If a horizontal after-nystagmus appears he will conclude that the semicircular canals are active, and therefore that such deafness as exists is congenital and that there is hope that the child's hearing will yet develop. If, however, the semicircular canals are inactive he will conclude that the ear damage has been acquired probably through meningitis, and that the prognosis for hearing is almost hopeless.

WHAT CAN BE DONE FOR DEAFNESS

It is a fundamental of good medical practice that every discharging ear should have adequate treatment. Such cases are, and should be, referred to the otologist. It should be the interest both of the otologist and of the general practitioner to treat not merely the suppurating process but also the deafness. The parents of a moderately deaf child should be advised as follows.

1. To go to an ear specialist for functional tests and otological examination.
2. To follow strictly his advice and treatment.
3. That the child should sit in the front seat in the class.
4. The teachers should be instructed by the physician to favour even the moderately deaf child by clear enunciation.
5. The moderately deaf child must not be sent to a special school for the hard of hearing. The latter should be reserved only for the very deaf.
6. An electrical hearing device should be provided, so that the child may have the maximum amount of help in receiving the instruction given to the rest of his class-mates. Care must be taken to see that the hearing device does not distort sound. This is best judged by watching the pronunciation of the child. The child will be quick to copy. He will copy the distorted sound as well as the correctly received sound. If there is much distortion it is proof that the instrument requires adjusting or else replacing.

As an argument to help a parent understand the necessity for buying an expensive hearing device for his deaf child, point out to the parent how unnatural his child's voice sounds in comparison with the voice of a child who hears normally. Tell the parent that the normal child has a pleasant voice because he hears the speech of others correctly, and that his deaf child has an unpleasant voice because of the inaccurate way in which he hears the voice of others. This alone should impel the parent to make the experiment of using magnified voice in the education of his hard-of-hearing child. Note that I am advising the use of an electrical hearing device for the purpose of the mental education of the deaf child. It is not for the re-education of the ear.

The physician should be warned against all methods of re-education of the ear by stimulating it with sounds. We know from experience that improvement in hearing does not occur from the use of an electrical hearing device, and we also know that over-stimulation by sound can actually harm the remaining hearing. A great many deaf mutes have some degree of residual hearing. Every attempt should be made to give such a child all the improvement that can be derived from a suitable electrical hearing device. Deaf children react favourably and quickly and show interest and give attention. It is remarkable how quickly the family responds and treats the deaf mute child naturally and in an intelligent manner.

Every young pædiatrician should visit the school for the deaf of his province. He would be surprised at the ingenuity shown in teaching deaf-mutes how to speak, and how they learn

useful trades such as carpentry, gardening, shoemaking, wood carving, and how they are educated. Not long ago I saw one who had achieved a university degree.

WHAT CAN BE DONE TO PREVENT DEAFNESS

Deaf-mutism, mal-development of the internal ear mechanism, and otosclerosis are hereditary diseases. It is obvious that the most important step in the prevention of deafness is the prevention of congenital cases. Dr. James Kerr Love has elaborated this point very clearly.

"Medical readers do not require to have the principles of Mendelism explained to them. Mendelism is the only theory which explains the facts of hereditary deafness and it only requires a broad enough view of the theory to include not only the clearly hereditary cases, but the apparently sporadic cases as well. If the hybrid does not marry a deaf-born person and does not meet another hybrid, no deafness will follow in the offspring. But as there are three hybrids for every deaf-born person and as we have no test for such latent deafness—no test for a recessive—the prevention of congenital deafness will always remain a difficult, and, perhaps in part, an insoluble problem.

"Assuming then that Mendelism holds the key to the diminution if not to the extinction of congenital or hereditary deafness; assuming too, that we have a population willing to be guided, what suggestions may be made for the attainment of our object?

"1. The deaf-born or the children of the deaf-born should not marry into families in which any case of congenital deafness has occurred either in the direct line or in the collateral branches. Should such marriage take place sterilization or birth control or any other precaution seems justified. This should apply to the hearing members (hybrids) on both sides.

"2. As there are three hybrids (apparently normal people) for every deaf-born person, all hearing people, before entering marriage, should ascertain whether any case of congenital deafness has occurred among their relatives.

"3. Even the deaf-born may count on hearing children should he be able to marry into a pure hearing family.

"4. Even should all such precautions be observed congenital cases will occur, because the hybrids which seem normal will meet and the so-called sporadic cases will occur, but the scheme above outlined would result in the rapid diminution of congenital or hereditary deafness.

"5. During the last year of school life all children—now aged 15 years—should be instructed in Mendelism. This may be done as a short course in natural history. It is no use postponing such information till the deaf-born have fallen in love during their meetings in missions or clubs for the deaf.

"Such a scheme seems better than legislation for the prevention of deafness. It should never be forgotten that apart from their deafness the deaf-born become useful and capable citizens. But deafness is a great handicap. I have never heard, except in the pages of a novel, of a mother who hoped her child would be born deaf.

"It is unlikely that any ductless gland specific ending in 'in' will be discovered to combat congenital deafness. This latter is a defect—not a disease, and so far as we see at present will only be controlled by education and by prudent marriage."

Childhood is rightly regarded as the most precarious period in life so far as the ears are concerned. I have already stated that certain diseases of childhood — meningitis, measles, scarlet-fever and influenza—are the most important causes of both middle-ear and nerve deafness. It follows, therefore, that the most important way of preventing deafness is the safeguarding of the child's health during the pre-school years, particularly. Many mothers still cherish the belief that the young child should be exposed to the infectious fevers of childhood. I hope you will appreciate from what has been said that this is a seriously erroneous point of view. An older child is better able to fight off infection, while a young child purposely exposed to these diseases may become stone deaf as the result.

During these infectious diseases of childhood the ears should have daily inspection for the earliest signs of infection. It has been proved experimentally that small doses of diphtheria toxin placed in the middle ear rapidly cause deafness and extensive histopathological changes, such as rapid degeneration of the ganglion cells of the spiral ganglia. The inference to be drawn from this is that the ear-drums of children suffering from the infectious diseases should be incised at the earliest justifiable moment and that the incision should be made so adequate that drainage will be long maintained.

Otitis media and all its sequelæ, are among those causes of deafness which should be preventable. No step should be left untaken which will help to prevent recurrences of Eustachian tube infection. The first requisite is, therefore, the prevention of nasopharyngitis. The way to cure middle-ear deafness is to restore the nasopharynx to health before an incurable state of affairs has been set up in the middle-ear apparatus. This is the rationale for our insistence on cleaning out the adenoid. Dr. J. Grant Strachan, of our hospital staff, recently examined a hard-of-hearing child whose tonsils and adenoids had been removed without any improvement; in fact, the condition had been made worse. Additional history was given that each time the child's ears had discharged the hearing had temporarily improved. He discovered and removed a pad of adenoid behind each Eustachian cushion, with the result that there has been a tremendous improvement in the hearing.

Finally, if it be reasonably established that the existent deafness is progressive, every possible focus of infection should be eradicated and particular attention should be given to elimination and attention also be paid to the diet, particularly the intake of vitamin B.

WHAT IS BEING ATTEMPTED BY WAY OF INVESTIGATION OF DEAFNESS

Whereas fifteen years ago there was almost a complete lack of investigation of ear problems in English-speaking countries there is now marked activity in nearly every British and American medical school of importance. The investigations cover the entire field of biological activity. The anatomy, histology, physiology and pathology of the ear are being actively studied from many new points of view, and the science of otology is in process of being rewritten.

Of great practical importance is the determination by experiment of the effect of various lesions in the middle ear and of various drugs and toxins on the hearing. Thus it has been proved that: multiple incisions, or an almost complete circular incision of the drum, has practically no effect on sound transmission, provided that the ligaments and joints of the ossicles are not injured; any experimental lesion that interferes with the mobility of the ossicles or increases the rigidity of the ossicular chain is always associated with a marked decrease in the transmission of low-frequency words and tones; extreme tension on the tensor tympani tendon reduces the transmission of low tones until they are no longer audible; while division of the tensor tympani tendon impairs the transmission of high tones. These experiments suggest that impaired function of the tensor tympani muscle may be one of the common causes of deafness. It has been shown experimentally that diphtheria toxin injected into the middle ear causes almost complete deafness and rapid irremediable degenerative changes in the spiral ganglia of the cochlea.

It has long been known that one of the drugs which can produce deafness is quinine. Recently, observation has been made suggesting that pre-natal medication of quinine is a possible etiological factor of deafness in the new-born. Obstetricians of standing, however, have statistically shown that the incidence of deafness in a large number of cases over many years, is as

great where no quinine has been administered as where quinine has been administered. On the other hand quinine has been found in heavy concentration in the spinal fluid of the new-born infant, and it must be seriously considered whether fetal idiosyncrasy to quinine may not be responsible for congenital deafness in certain cases, and perhaps in many more cases than have ever been suspected. This matter is receiving experimental investigation, for, in spite of the great value of quinine in obstetrics, the tragedy of congenital deafness is so serious that obstetricians might well find other methods of sensitizing the uterus to contraction than by the use of quinine.

Through the American Otological Society efforts are being made in the United States and in Canada to correlate the research now being conducted so that the results in one laboratory are being checked in another and so that there is as little duplication of endeavour as possible. The experimental investigation of deafness is one of the most useful and promising fields of medical investigation of the day.

CONCLUSION

Finally, from the all-important view point of the education of the child, it is necessary to stress the necessity of recognizing defective hearing at the earliest possible age. Every infant is born dumb, but irremediable deafness at birth is rare. Later on, due to the sense of hearing, the child acquires articulate language.

Infants who have some degree of deafness are comparatively common, but not infrequently the mother can so make use of the hearing a child possesses in the training of the child that it grows up with fairly useful hearing; but every infant born totally deaf will remain dumb. In the pre-school age hearing plays a decisive rôle in the learning of speech. The child does not learn to speak properly unless it has good hearing, and such ability to speak as it has may be lost or not maintained if it develops a hearing defect. The hard-of-hearing school-child suffers a very severe handicap, which is the more severe because frequently neither the parent nor the school teacher nor the physician has appreciated that the apparent stupidity of the child has its cause in deafness. Slight but significant hearing impairment is often the cause of retardation, a speech defect, an inferiority complex, or even unusual behaviour. Many children who have not been recognized as deaf or hard-of-hearing fail at school, and have to turn to other channels because they cannot keep up with their school mates. Educational authorities have discovered that there are several times as many repeaters among the hard-of-hearing children as among normal children, and that therefore the deaf child is an expensive burden. Along with this discovery they are becoming more and more awake to the fact that the handicap of deafness segregates the deaf child from the normal child and makes him less fit to develop into a helpful citizen in his adult years.

POLIOMYELITIS: VITAMIN B DEFICIENCY A POSSIBLE FACTOR IN SUSCEPTIBILITY*

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DRAPER has defined poliomyelitis as "an acute infectious disease in the course of which paralysis is but an accidental and incidental occurrence". Aycock estimates that in the worst epidemics 1 person in 500 contracts poliomyelitis; but, if "abortive" and non-paralytic cases are included, it may be one in ten. In other words, there may be fifty mild or subclinical cases to one frank paralytic case. In a recent epidemic in Greenland (1932) Hrolv¹

reported 83 pronounced cases in a total population of 2,263, resulting in 20 deaths. He states that during the epidemic "nearly all the inhabitants complained of headache and indisposition for two or three days, particularly the children, many of whom had headache with moderate constipation and mild fever". It was his belief that these persons were more or less infected without presenting definite symptoms of acute invasion or signs of paralysis. A previous epidemic in Greenland (1914) resulted in

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37 deaths in a population of 700. At that time the outbreak began with an "influenza-like" disease which was so general that the reindeer hunt of the season was a complete failure. Paralysis was observed in some of the hunters after their return home.

In the more recent epidemic in Toronto, during the past summer, in a population of approximately 650,000, there were 747 cases reported, 183 of which exhibited paralytic symptoms, resulting in 30 deaths. Two-thirds of the cases reported were under 10 years of age, and three-fifths were in males. During this epidemic there were doubtless hundreds, and possibly thousands, of subclinical or potential "polio" cases, of the "summer flu" type, that responded to the usual home treatment without medical attention.

With the accruing evidence from repeated epidemics it becomes increasingly obvious that a much smaller proportion of the reported cases actually suffer paralytic involvement, as compared with the earlier history of the disease, when the paralytic cases only were recognized. It would therefore appear that the hypothetical virus of this disease, which has in the past been regarded as specifically neurotropic, is little more selective in its action on the central nervous system than the infectious agents of other diseases, notably diphtheria, malaria and influenza.

Myers² reports 1,316 cases of diphtheria with 275 developing paralysis, and 80 deaths, most of the latter being due to cardiac paralysis. Of the paralytic cases, as to age, 104 were under 5 years, 138 were from 5 to 10 years and 33 were above 10 years. There was a marked preponderance of paralysis among the males. The paralysis usually comes on during convalescence. Occasionally, however, it occurs in the early stage of the disease, even on the 2nd or 3rd day. The close parallelism in these figures as to age, sex and paralysis incidence, when compared with the poliomyelitis figures in the recent Toronto epidemic, is most striking.

Zingher,³ in a report on over one thousand cases of poliomyelitis under 5 years of age, found over 80 per cent to be Schick-positive. Baginsky says: "I have been struck with the very extraordinary sensitivity of children suffering with such diseases of the central nervous system as poliomyelitis, spastic cerebrosplinal paralysis, hemiplegia, etc. One is scarcely able to keep these children in the hospital wards free

from infection with diphtheria." The situation in this respect at the present time may be somewhat altered owing to the general adoption of toxoid immunization.

In a comparative study of poliomyelitis and diphtheria Jungeblut⁴ reports poliocidal substances occasionally demonstrable in the serum of monkeys actively immunized against diphtheria toxin. He and his associates also found that contact *in vitro* with adrenalin, cortin and vitamin C is equally destructive for both the toxin of diphtheria and the virus of poliomyelitis. In a discussion of the predisposition of certain constitutional types to severe forms of diphtheria, Seckel reports six cases with five deaths, two of which patients were previously attacked by poliomyelitis; while Wernstedt reports three cases of poliomyelitis, one fatal, which developed in children within 11 to 19 days after the onset of diphtheria. In reviewing this subject Jungeblut concludes that the data presented "are strongly suggestive of the operation of some common basic mechanism which governs susceptibility and resistance to both poliomyelitis and diphtheria". Obviously there must be some constitutional factor which determines the age and sex incidence and susceptibility to paralysis.

Draper has emphasized the frequency with which certain constitutional types are found in poliomyelitis wards. He notes specially the prevalence of wide interpupillary spaces, high-arched palates, cleft upper incisor teeth, etc., with the inference of a possible endocrine imbalance as an endogenous factor in susceptibility. With reference to this factor he further states: "The highly specialized type of child described above is a causal factor of equal importance with the virus in the occurrence of infantile paralysis; but, so far as development of paralysis is concerned, the constitution of the child is of greater significance than the virus."

On the assumption of possible exogenous factors in susceptibility, based on nutritional imbalance, the recent work of Jungeblut and Toomey is of interest. The former, in experimental poliomyelitis in monkeys, has obtained a fair degree of protective effect from vitamin C when administered within a rather definite range of dosage. The latter has demonstrated increased susceptibility when vitamin D is withheld in conjunction with a diet otherwise rich

in vitamins. But, strange to say, little or no work of a conclusive nature has been done in this respect with the anti-neuritic vitamin B. With the established anti-paralytic effect of vitamin B in beriberi it would seem that this pioneer in the vitamin field should offer the most hope of protective value in poliomyelitis.

Recent reports of successful treatment of many common paralytic conditions by vitamin B give support to this hypothesis. Favourable results have attended the administration of vitamin B concentrates in the treatment of alcoholic polyneuritis,⁵ post-diphtheritic paralysis,⁶ neuritic paralyses associated with pernicious vomiting of pregnancy (based on the belief that a fetus increases the demands on the mother for vitamin B, while persistent emesis decreases the maternal intake), and the paralyses of diabetes and pernicious anæmia,⁷ referable to impoverished diet. Swineford⁸ reports paralysis in a prolonged typhoid case, in which administration of vitamin B brought about prompt relief of the neuromuscular symptoms. Vorhaus and his associates⁹ report the favourable treatment of 100 cases of neuritis with 10 mg. of crystalline vitamin B daily. Three of their cases which were associated with pregnancy were completely relieved of their neuritic symptoms. Gerstenberger¹⁰ reports remarkably favourable results in the vitamin B treatment of herpes, a neuropathy referable to a neurotropic virus and classified pathologically as a posterior poliomyelitis. Hoobler¹¹ reports a favourable response to vitamin B therapy in a number of cases of toxæmia in infants associated with muscular rigidity. Gruenfelder and his associates¹² interpreted a form of infantile toxæmia occurring in Jerusalem in the hot weather as a form of vitamin B deficiency, and obtained surprisingly good results with vitamin B concentrates intravenously.

In a comparative study of poliomyelitis and beriberi many features common to both diseases provide a striking similarity. In poliomyelitis mostly infants and juveniles are attacked, with a noticeable predilection for males, while beriberi has its greatest incidence in infancy and in young adult males. Poliomyelitis has its peak of incidence in the hot weather—July, August and September in northern temperate climates—and the corresponding summer months in southern temperate climates; while beriberi pre-

vails in tropical climates where the weather is warm almost constantly. Both diseases are predominantly characterized by flaccid paralysis of the leg muscles, with ascending and bulbar varieties involving the cranial nerves, and with very similar neuropathology. Gastro-intestinal disturbances and muscle tenderness are characteristic of both diseases, œdema is pathologically common to both, and physical over-exertion is a well recognized predisposing factor in both.

A striking illustration of the possible basic relationship of poliomyelitis and beriberi is provided in the epidemiological history of Nauru, a small volcanic island in the southern Pacific ocean. Previous to the Great War this little island of eight square miles area was a German colonial possession, but has been under mandate to Australia since 1919. The population in 1910 consisted of 1,250 native Nauruans, about 500 natives of the neighbouring Carolines, about 500 Chinese, and 80 Europeans. The last three groups were all employees of a phosphate mining company, the sole industry of the island.

In 1905-6 the German colonial physician reported a number of cases of "infectious polyneuritis" on the island, followed in 1910 by what is regarded as the most intensive epidemic of poliomyelitis on record. Within 14 days some 700 cases developed, resulting in 38 deaths. The greatest incidence of the disease was among the native Nauruans, with 470 cases and 37 deaths. There were 220 cases with one death among the Carolinese phosphate workers, these all being treated in the company's hospital. The Chinese were completely exempt, and among the Europeans there were only three mild cases. The onset of all cases was with fever and chills followed by digestive disturbances, constipation and sensation of pressure or fullness of the stomach (a symptom common in beriberi, due to gastric atony). Vomiting, diarrhœa and headache were also common. Pain in the back of the neck, lumbar region and legs was often noted, all the muscles being very sensitive to pressure. Paræsthesia and paralysis developed in most cases, usually disappearing during convalescence, although at the end of three months there were some 50 cases of pronounced residual paralysis. Œdema of the legs below the knees was noted in a number of cases (suggestive of wet beriberi). In most of the fatal cases respiratory paralysis developed. Diplopia was noted in two cases and œsophageal paralysis in one case. The pulse rate, compared to the fever, was noticeably accelerated (a feature common to beriberi).

The age-incidence of the epidemic was somewhat unusual for poliomyelitis, most cases being within the limit of 12 to 40 years. The old people were completely exempt, as were most of the young children, in spite of constant contacts. Three nursing infants were afflicted along with their mothers (such cases are rarely noted in poliomyelitis, but not uncommon in beriberi).

A striking feature as to incidence was the fact that among the Carolinese workers of the phosphate company nearly all the severe paralyses occurred in a group that came from the island of Singelap, although they constituted but 15 per cent of the Carolinese workers. A noticeable constitutional characteristic of these, as in the Nauruans, was a "spongy fattiness" (suggestive of general cellular œdema, indicative of a beriberi background).

The transmission of the disease to the island could not be established. Vessels from Australia, which had been 11 days in transit, had no cases on board; and steamers from Hong Kong, nearly three weeks en route, had no cases, and neither was there any similar disease

at ports of call. Natives arriving by these steamers were and remained healthy through the entire epidemic.

Owing to the unusual epidemiological features of this outbreak the local colonial physician, Dr. A. Müller, was hesitant in identifying the disease as poliomyelitis. Aside from the neuromuscular phenomena he regarded the epidemic as typical of influenza, especially the rapid spread and almost simultaneous incidence of the cases. However, some years later many of the victims of this epidemic were very carefully examined and found to have residual paralyses and deformities characteristic of poliomyelitis, and at the present time the identity of the disease is generally regarded as established.

In October, 1920, the post-war pandemic of pneumonic influenza swept the island, with an incidence of 100 per cent and a mortality rate of 30 per cent. In the trail of this holocaust ill health and debility were everywhere manifest, a condition which was apparently aggravated by an obvious dietary deficiency. To make matters worse, leprosy broke out and spread so rapidly in spite of the usual precautionary measures that by 1925 fully one-third of the population exhibited clinical signs of the disease.

In 1926 Dr. G. W. Bray, the new medical officer of health under the Australian régime, who had noticed that for a number of years previously the native infant mortality under one year of age had been almost 50 per cent of the total births, made an investigation of the dietetic habits of the natives in an effort to remedy the situation. Previous to this time the sale of polished rice had been forbidden, and the use of fermented "toddy", made from the sap of the cocoanut tree, had also been interdicted, but no restriction was placed on the consumption of sugar, white flour and canned meats, all of which were void of vitamin B. Dr. Bray had noticed that most of the infant mortality had occurred in breast-fed babies during the third month from birth, and that this condition did not apply to infants separated from their leprous mothers and fed artificially by relatives. Most of these infant deaths had been recorded as due to "stomach trouble", "infantile diarrhoea", "convulsions", "marasmus" and "broncho-pneumonia", but Dr. Bray concluded from a careful analysis of the situation that the basic ailment was infantile beriberi, similar to the type so often seen in Japan and the Philippines. Accordingly, samples of the mothers' milk were tested chemically and biologically. The protein and fat were found to be low and the sugar high, due perhaps to the habitual use of sugar-water by the native women as a beverage. Samples of the milk fed to chickens produced typical polyneuritis in about three weeks, which was readily cured by feeding yeast. Based on the obvious assumption of a vitamin B deficiency, a radical change in the native dietary was instituted. The sale of white flour and polished rice was forbidden in the native stores, whole-meal flour and brown rice being substituted, and the use of whole wheat bread was encouraged. Sweet potatoes were introduced, and the value of eggs and condensed milk was stressed. The sale of sugar was restricted to 1 lb. per adult per week. The use of the yeast-laden cocoanut-sap beverage was again permitted, and the sick babies were treated with an emulsion of the yeast in cod-liver oil. As a result of these measures the infant death rate rapidly fell from 50 to 7 per cent, at which level it has consistently remained. Not only has there been no further reported occurrence of "poliomyelitis" or infantile beriberi, but even leprosy and tuberculosis, which were rife on the island, have been almost completely eradicated. This is in harmony with the observation of Takaki, that whenever beriberi was reduced in the Japanese navy the health of the men improved generally and other diseases decreased.

The most obviously logical conclusion from the above narrative is that vitamin B deficiency furnished the basic background for most of the neuropathological conditions of this unfortunate island. It, perhaps, may have ac-

counted for the unprecedented high rate of incidence of the 1910 epidemic of "poliomyelitis", and may have contributed to the unusually high mortality of the 1920 epidemic of influenza—a disease also noted for its effect on the nervous system. It was probably also the chief etiological factor in the "infectious polyneuritis" of 1905-6.

On the assumption of B hypovitaminosis as common to poliomyelitis and beriberi the deficiency may conceivably be precipitated in the former as a sequel to the acute infectious invasion, in which the febrile state, by greatly increasing the metabolic demand for the vitamin, brings about a rapid depletion of its storage in the tissues; whereas in the latter the vitamin deficiency is generally of slow and insidious onset as a result of long continued dietetic error and prolonged action of predisposing factors. Under these conditions it is quite conceivable that the degree of destructive action on the central nervous system might be materially different, the protective responses of the organism having more time to act in beriberi than in acute poliomyelitis. There are not a few instances, however, in which a febrile infectious invasion has precipitated beriberi. Bentley¹³ reports 52 cases of beriberi in which 28 appear to have been the sequel of recurring malaria or dysentery and allied conditions. Three cases of beriberi following relapsing fever are reported by Yacoub, associated with prolonged feeding on condensed milk, a food containing a scant amount of vitamin B. In Brazil beriberi is so frequently associated with a preliminary febrile condition, of an influenza-like nature, that clinicians in that country still regard the disease as basically infectious.

There are a number of determining factors in relation to the vitamin B requirement of the organism which have a direct bearing on the question of its possible deficiency in poliomyelitis. In the first place it has been shown by Gaynor and Dennett¹⁴ that the storage of vitamin B in the tissues of young children is very limited, excess supplies of the vitamin being quickly exhausted from the system. Hendricks¹⁵ and Cowgill¹⁶ have shown that the vitamin B requirement bears a direct relation to the metabolic rate. According to DuBois, with increased physical exertion and in all febrile states there is a marked increase in the metabolic rate. Accordingly, under these conditions there would be a corresponding depletion of the tissue storage of vitamin B. In fevers associated with gastro-

intestinal disturbances, such as in beriberi and poliomyelitis, the depletion of the anti-neuritic vitamin is not only thereby hastened but the ingestion and assimilation of new supplies is cut off. The metabolic rate has its highest peak at the period of most rapid growth and activity, in childhood, declining gradually with maturity and advancing age. The metabolic rate is also higher in the male. It is, therefore, perhaps not without significance that the age and sex ratios of the metabolic rate, and consequently the corresponding ratio of the vitamin B requirement, bear an almost parallel relationship to the age and sex incidence of paralysis in poliomyelitis, diphtheria and beriberi. The seasonal influence of gastro-intestinal disturbances in children, such as "summer flu", "stomach flu" and "summer complaint", with their depleting effect on vitamin B tissue storage, may also be a contributing factor in the seasonal incidence of poliomyelitis. Another factor related to vitamin B demand and seasonal incidence may be the marked increase in growth and physical activity of children during the school holidays in the summer months. Prof. W. T. Porter, of Harvard University, found in the observation of 3,000 school children that the seasonal period of greatest growth and weight increase was during the summer and early fall.

In view of all these factors contributing to vitamin B depletion it seems not unreasonable to conclude that an acute deficiency of this essential anti-neuritic element may so condition the nervous system that the infectious agent of poliomyelitis may more readily effect destructive action resulting in paralysis.

An interesting sidelight in this connection is the reported observation of concurrent epidemics of paralytic diseases in domestic animals, notably dog "distemper" and encephalomyelitis in horses, sheep and cattle. It is not, perhaps, merely coincidental that these animal diseases, which exhibit pathological changes in the central nervous system almost identical with poliomyelitis in man, also have relatively the same age, sex and seasonal incidence. Even the ancient Greeks and Romans recognized the seasonal incidence of disease, notably during the "dog days" (dies caniculares) in July and August, associated with the influence of Sirius the dog star. Hesiod tells us that "Sirius parches head and knees" (typical of poliomyelitis). Homer speaks similarly, calling it the evil star, the star of late summer. The pestilences which then prevailed occasioned the offering of sacrifices to placate the inimical star.

On the basis of the deficiency hypothesis advanced herein many of the hitherto unexplained features of poliomyelitis may be somewhat

clarified. Aside from the age, sex and seasonal incidence, which seem definitely related to the metabolic demand for vitamin B, it would account for the spotty and relatively small incidence of paralytic symptoms, the conspicuously noticeable lack of contagious relationship between such cases, and the recognized ineffectual control by quarantine. Davison¹⁷ says: "Isolation for three weeks of patients and contacts is required by most boards of health since 1916, but the evidence then and now does not indicate that anything is accomplished by this procedure. . . . The disease rarely attacks more than one member of a family, and cases developed from contact are conspicuously rare. Of 2,070 persons definitely exposed only 14 contracted the disease . . . patients with the non-paralytic or subclinical type of the disease must be so common that nearly the whole population should be isolated."

In the last quarter century there has been a gradual advance in the age line in poliomyelitis. The cases under five years, in New York City, in 1907, were 86.8 per cent; in 1916, 79.2 per cent; in 1931, 53.3 per cent; in 1935, 32.8 per cent. In Philadelphia the cases under five years were, in 1916, 71.1 per cent; in 1932, 51.5 per cent. A similar advance has been noted in the Toronto epidemics. Improved infant hygiene, particularly the adaptation of the newer knowledge of the vitamins to the dietetics of infancy and childhood, has significantly paralleled this advance in the age line.

In recent years considerable prominence has been given in both the medical and commercial world to the importance of the vitamins, particularly the A, C and D varieties, as reflected in the increased use of fish-liver oils and citrous fruits, irradiation of food products, and exposure of the body to ultra-violet lamps and sunlight; but vitamin B seems to have been left in the background. The infant and young child of today are amply supplied with vitamins A, C and D in the form of cod-liver oil, orange and tomato juice. A scant supply of vitamin B is supplied in both human and cow's milk; but no routine measures are employed to contravene vitamin B deficiency in the diet of young children at a time when rapid growth makes increased demands for this essential food element. McCollum points out that there is very clear evidence that nutritive disorders

have a far-reaching influence in controlling the health of children, bringing about many border-line cases of malnutrition. He emphasizes the danger to health in adherence to a diet in which milled cereal products, particularly white bread, and sugar, syrup, tubers and meat of the muscle type predominate (all deficient in vitamin B). Williams says: "The discovery of the vitamins has entirely altered our conceptions of the causes and origins of disease. Until lately disease was regarded as a sin of commission by some unseen and subtle agency. The vitamins are teaching us to regard it, in some degree at any rate, as a sin of omission on the part of civilized or hypercivilized man. By our habit of riveting our attention on microbes and their toxins we had sadly neglected the side of the question which concerns itself with our own defences."

SUMMARY AND CONCLUSIONS

An attempt has been made to interpret the incidence of paralysis in poliomyelitis as referable in some degree to an acute deficiency of vitamin B. This, it is thought, may be brought about, in border-line cases of hypovitaminosis, by age, sex and seasonal factors determining an increase in the metabolic demands for the said vitamin, combined with the precipitating, vitamin-depleting influence of an acute systemic invasion by an infectious agent of known neurotropic properties. No experimental or clinical data are submitted in support of the theory advanced, but, if its basis is physiologically sound, it would appear that a fair clinical trial

should be given to this natural nerve-protective agency which has proved to be so effectual in the treatment of other paralytic conditions of undoubted similarity. The use of this simple remedial agency would not be fraught with any of the dangers which have attended the use of serological and chemical agencies.

It is expected that the most hopeful application of the theory advanced should be in prophylaxis and during convalescence, rather than in the acute invasional stage of the disease, since the onset is so rapid that neuromuscular damage often occurs before the disease is recognized.

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PRURITUS ANI*

By JAMES T. DANIS, F.R.C.S. (EDIN.)

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PRURITUS ani may be defined as an irritative condition of the skin in the peri-anal region. Numerous causes have been suggested as the etiological factors and several classifications of the condition have been offered. I should like to submit the following practical classification of three groups.

Group one: in which there is no gross or

microscopic change in the peri-anal skin, *i.e.*, in which itching is the only symptom. The common *direct* causes of this variety are: (1) lack of cleanliness; (2) certain types of underwear; (3) the presence of an irritable discharge from the rectum; (4) idiosyncrasies to certain foods; (5) parasites. The *indirect* causes are those referred from infection of the prostate (urethra), vagina, cervix, and, rarely, from a lower abdominal viscus, and neurosis. This group makes up about 5 per cent of all cases.

* A paper read at the Sixty-eighth Annual Meeting of the Canadian Medical Association, Section of Surgery, at Ottawa, June 23, 1937.

Group two: in which there are gross and microscopic changes in the peri-anal skin, and in which other skin lesions are present. This group would include such conditions as epidermophyton, in which the skin of the ischio-rectal fossæ, buttocks, groins, hands, feet, and possibly the lower half of the face, are affected.

Group three: in which the peri-anal skin alone shows changes. This group makes up over 90 per cent of the cases.

TREATMENT

The treatment of the first group is removal of the cause, for example, by change of underwear, correction of the diet, etc. The treatment of the second group belongs to the dermatologist.

The treatment of the third group is the one I wish to speak of particularly here. That this condition lends itself most stubbornly to treatment is shown by the innumerable remedies offered for its relief. In the belief that this is purely a skin lesion a countless number of ointments have been tried, with no permanent result. X-rays, ultra-violet rays, quartz light and radium have been tried by those skilled in their application, but the relief has only been temporary.

While no one knows the real cause of this type of pruritus ani, I am convinced that it lies in the sensory nerve fibres of this part of the skin. It would seem that any procedure which would bring about a permanent degeneration of these fibres without destroying the motor fibres would be the logical one. The operation devised by Sir Charles Ball is based upon this principle, but, unfortunately is attended with the return of symptoms in about 50 per cent of cases.

Subcutaneous injections of solutions in oil of various cocaine derivatives: nupercaine, procaine and A.B.A. solution, in the hope that their effects would be prolonged, have met with varied results. Claimed cures vary from 20 to 50 per cent. My own experience is that a small percentage, 20 to 25, shows a permanent cure. In the great majority of instances the treatment must be repeated, and repetition does not ensure permanent cure. Any form of treatment which is not recompensed by at least a 75 per cent cure should not be considered successful.

In the past two years I have been using a method first introduced by Stone, and since modified by Buie. It consists of a subcutaneous

injection of a 40 per cent solution of ethyl alcohol beneath the affected area. A long flexible needle is used. My personal preference is for a Labatt needle about four inches in length and 20-22 gauge. Between 20 and 40 c.c. are used. Under spinal anæsthesia the needle is introduced into the coccygeal region and carefully pressed to a point just short of the bulbus urethræ, or perineal body. The solution is injected evenly so as to iron out the folds as the needle is gradually withdrawn. The opposite side is injected likewise, without making a fresh puncture if possible. Complete anæsthesia is established at once.

I know of no surgical procedure which requires more post-operative care. The injected part must be kept as clean and dry as possible. Warm saline baths are instituted the day after injection, and carried out every four hours, the skin dried and painted with an antiseptic solution such as metaphen. This procedure must be carried out for about two weeks, during which time the patient must be in hospital. The danger period is from the tenth to the twelfth day, *i.e.*, when other surgical cases are well on to recovery. One of the dangers of this method of treatment is sloughing and abscess formation. A little sloughing is not an undesirable feature. I may say that careful supervision during the post-injection period will reduce the occurrence of this complication. I would frankly state that this complication rarely occurs in my cases.

I have met with only one total disappointment. One other case has not been completely cured, but relief has been so marked that further treatment is not necessary. In only one case has sloughing caused me any concern, but this patient has been completely cured. Small isolated areas of sloughing have occurred in about 12 of my cases, but this was of a minor nature and of no consequence. Most of cases in which sloughing has occurred were associated with the development of small abscesses. In this series, one patient had had syphilis and had successfully undergone specific treatment. I do not regard syphilis as a causative factor of this condition.

DISCUSSION

DR. C. K. P. HENRY.—Dr. Danis has just spoken to us on a subject of widespread interest, as pruritus ani is a condition which affects young, old, male and female, rich and poor. To discuss this one should have a proper conception of its frequency, its etiology, and the possible methods of treatment.

It is apparent that Dr. Danis has had an unusual number of cases for treatment. In the Montreal General

Hospital, which is composed of public, semi-private and private beds to the total number of 600, I have searched the indexes of diseases, primary, associated and complicating conditions, in the central division (largely public) and in the western division (largely private) and I was surprised at the small number of cases recorded in both divisions, with the exception of the department of gynaecology, where such cases have been taken up by Dr. A. D. Campbell, chief of this division, and Dr. B. Usher, of the dermatological department. During the six-year period, 1931 to 1935, a total number of 51,257 cases were admitted (not including gynaecological patients). In the index under "pruritus ani" 17 cases were listed, or less than 1 in every 3,000! It may interest you to know that of these 17 there were 8 females and 9 males; 3 were very obese and 6 had either diabetes or altered sugar tolerance. Ten patients were admitted to Surgery, 6 to Medicine and 1 to Neurology. Nine of the 17 had hæmorrhoids, anal fissure or rectal polyp, and the pruritus ani was considered to be secondary to these conditions. Seven were operated on. Five cases showed marked changes in the peri-anal skin. In 6 of the 17 cases no definite cause for the pruritus ani, other than general conditions, diabetes, anxiety state, obesity, etc., was established. This showing must indicate that in the northern climate of Montreal we have fewer cases, or fewer cases are admitted to hospital, or we do not record this diagnosis in all cases!

As regards etiology, in the cases above studied and in my own cases I am struck with the large number

of patients who are obese, and that they nearly all had some rectal condition which frequently appeared to be the etiological factor. From the standpoint of a surgeon, I believe that in every case proctoscopic examination should be made, and that hæmorrhoids, fistulæ, tags, polyps, etc., should be treated. For many years, in cases of marked dermatological changes, I have undercut the skin widely, as is done in Little's operation, by puncture at two or four points, and have had very satisfactory results therefrom.

Dr. Danis' method appears in his hands to give a very high percentage of cures, but, obviously, it will impress most of us with its time-consuming convalescence, and the occasional sloughing of the skin, though Dr. Danis himself has not encountered this. By dissecting out the pudendal and other cutaneous branches an equally complete cure may be expected, without the objections I have just mentioned. Necessarily, any operative treatment must be combined with post-operative cleanliness, hygiene, and often with some form of mental treatment; underlying factors, as obesity, diabetes, etc., must also be treated. Dr. Danis has presented a very timely subject for discussion. Alcohol injection has been efficacious for painful areas in tic douloureux, in intra-oral cancers, in intercostal and paravertebral injections, and its use is well authenticated, especially to precede more radical surgical treatment. Dr. Danis' method is to be classed with these other successful methods.

Case Reports

A CASE OF UNILATERAL INTRAPELVIC PROTRUSION OF THE ACETABULUM SO-CALLED ARTHROKATADYSIS

By W. H. WARDELL, M.D.

Moose Jaw, Sask.

Mrs. C.E., a frail woman, aged 56, married, two children grown up, weight 85 to 90 pounds.

I was called to see her on December 1, 1936, she being confined to bed, complaining of pain in the lower limbs, especially in the left hip joint. The left leg appeared somewhat shorter than the right. There was nothing unusual in the outward appearance of the hip. The right knee joint was arthritic. Her personal history was negative except for a progressively severe rheumatoid arthritis extending over a period of twelve years, with hands so deformed and painful as to be practically useless.

During the early months of 1936 she noticed vague symptoms of discomfort in the left hip. About the third week in August she fell on her left side while riding an escalator in a store in Vancouver. She was quite upset for some time by this, but with care from attendants in the store was able to walk out. After returning home to Moose Jaw the symptoms gradually became more aggravated in the hip, and about November she was unable to walk except with difficulty.

In the examination, pain prohibited any extensive manipulation of the hip joint. The attention was riveted on this and little notice was taken of the right knee, which was arthritic, the right limb being called upon to favour the left. I therefore advised an x-ray examination.

I am indebted to Dr. R. Michaud, Roentgenologist at the General Hospital, Moose Jaw, for an x-ray diagnosis, and also for some literature

he had on hand, by Levinthal and Wolin,¹ both orthopaedic surgeons of Chicago, and in which they give a brief review of the literature and comment on the etiology and pathology.

I cannot do better than quote in part from their article.

"This imposing name, meaning 'subsidence or sinking-in of a joint,' was suggested by P. J. Verrall,² of London, in 1929 for a peculiar condition of the pelvis which was first described by Otto in 1824. The characteristic feature is an intrapelvic protrusion of the acetabulum and the head of the femur. . . .

"The condition is characterized by a protrusion of the acetabulum into the pelvis and a narrowing of the joint space. This is apparently the end-result of a localized destructive process in the hip joint affecting essentially the acetabulum, resulting in softening and thinning of its wall. The deformity is evidently the result of weight-bearing and muscle pressure; the



Fig. 1

femoral head, pressing against the weakened acetabular floor, literally bores its way into the pelvis. The great trochanter approaches, and finally may impinge against the ilium, while the lesser trochanter comes closer toward the ischium. The hip joint is thus markedly deepened, its motion restricted, and the extremity shortened. . . .

"This is not a specific disease. The etiological factors in the cases reported in the literature have been quite variable, including osteo-arthritis, gout, gonorrhœa, syphilis, tuberculosis, trauma and endocrine disturbances. In a personal communication Mercer tells us that he believes the case he described was due to toxins of the tubercle bacillus, i.e., Poncet's disease. Pomeranz³ suggests that it may be an atypical but essentially non-specific arthritis of the hip joint. Schaap⁴ believes that some of these cases may be ascribed to a congenital anomaly in which the acetabular cavity is too deep."

All of Levinthal and Wolin's 5 cases were treated conservatively except one, with a choice between diathermy, radiant heat, massage, traction, salicylates, plaster casts, braces, etc., with no improvement in some and apparent improvement in others. In the one case an arthroplasty was done with marked benefit after failure of conservative treatment.

I am indebted to Dr. M. N. Smith-Petersen, Chief of the Orthopædic Service in the Massachusetts General Hospital, Boston, for helpful suggestions in procedure in a personal communication. I also have his report of a case.⁵ This report occasions no little surprise to one initiated for the first time into an acquaintance with these cases. One may infer that this is the first and probably the only one so far which has passed through that large hospital. He says:

"In February, 1935, a patient, aged 55, was admitted to the orthopædic ward of the Massachusetts General Hospital, with a diagnosis of bilateral intrapelvic protrusion of the acetabulum. The case was discussed on the ward rounds, and the general opinion was that nothing could be done for this patient and that she would have to adapt her life to the hip joint condition. This did not seem a constructive attitude and the patient was allowed to stay in the ward in the hope that some operative procedure might be developed which would give her relief from pain. The question was, what is the source of this patient's pain? The answer was—impingement of the femoral neck on the acetabular margin."

After further discussion, he goes on to say:

"The patient was informed that the operation had never been performed before, but that it did offer a

chance of success; she accepted the operation willingly. In four weeks she left the hospital walking and in four months she returned to her work as a housekeeper."

The report has nothing to say about conservative treatment, evidently not considered worthy of consideration from the outset.

An operation is devised and detailed whereby the hip joint is approached through a fairly long incision along the anterior third of the crest of the ilium and obliquely downward following the lateral border of the sartorius muscle, then finding one's way down between muscles without disturbing their relation except by retraction and the temporary severing of the direct head of the rectus femoris one comes on to the acetabulum and joint capsule. The technique here was quite suitable for our case, entitled "acetabuloplasty".

We removed a quarter to three-eighths of an inch from the upper and anterior bony rim of the acetabulum down to the notch, and with it all the anterior portion of the capsule and synovial membrane, including its distal insertion. By manipulating the limb we were able to demonstrate a healthy condition of the cartilage over the head of the femur, with a fairly sure inference for the same condition in the socket. There were no exostoses.

The patient was operated on on April 2, 1937, made a good recovery, with primary union of the wound. The pain in the joint was eliminated, and so far (October 20th) there has been no return of it. Hospitalization was twenty-one days following operation.

On April 19th re-examination by x-ray showed no change in the position of the head of the femur. Long range passive motion of the limb could now be made without pain.

Our patient was absolutely confined to bed for four months previous to operation, without any improvement. Movement of the limb, however small, caused pain, and this, with the prospect of having to put up with it for the rest of her life, helped her in the decision to take the risk of operation.

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MIGRAINE.—A. Schick reports the results of treating seventy-four cases of migraine with magnesium sulphate. A course of about twelve intravenous injections of a 50 per cent solution of magnesium sulphate was given. The first two injections consisted of 2 c.c. of the solution, and subsequently this was raised to 5 c.c. The injection

has to be given very slowly, preferably with the patient lying on his back. Out of the seventy-four cases treated forty-five obtained relief, four cases were cured altogether, while the remaining twenty-five were uninfluenced. The treatment proved harmless and was well tolerated in every case.—*Wien. klin. Wschr.*, August 20, 1937, p. 1205.

Therapeutics and Pharmacology

LOCAL ANÆSTHESIA FOR COLLES' FRACTURE

By C. C. ROSS, M.D., F.R.C.S. (EDIN.)

London, Ont.

A Colles is the most frequent form of fracture, with the exception of that occurring in the clavicle. Though it seldom causes loss of life yet frequently patients are left with a partial permanent disability due, it must be admitted, in most cases, to error in treatment. Since Abraham Colles first described the condition in 1814 our methods of treatment have gradually improved. One of the most recent is the use of local anæsthesia. Although this was advocated years ago it is really only since the outstanding work of Bohler, of Vienna, that the method has gained in popularity. In most of the large centres in Canada it is today the method of choice, although there are many practitioners who have not as yet adopted it.

To the writer this method offers the following distinct advantages—(1) only one medical man is required; (2) It obviates the dangers and discomforts of general anæsthesia; in elderly people or in persons who have recently had a great deal to eat or drink this is an important consideration; (3) there is no need for hospitalization or loss of time from work, as there frequently is with general anæsthesia; (4) many people fear general anæsthesia.

The disadvantages are—(1) the danger of infection; this with proper technique ought not to occur; (2) incomplete anæsthesia; this suggests, nearly always, an error in the application of the method.

The technique is as follows.

1. The lower third of the forearm and wrist is carefully prepared with iodine and alcohol.

2. With a hypodermic syringe one or two c.c. of 2 per cent novocaine are introduced into the skin and subcutaneous tissues over the posterior surface of the radius, a little above the site of fracture. If the styloid process of the ulna is fractured novocaine should also be injected in this area.

3. With a 22 gauge needle $1\frac{1}{4}$ inch in length attached to a syringe 20 c.c. of 2 per cent novocaine are introduced between the fragments of the fractured radius. This is best accomplished by inserting the needle downwards and forwards at an angle of approximately 45 degrees to the plane of the forearm. Usually the needle can be felt to enter between the fragments. To make certain of this, however, the plunger of the syringe should be withdrawn slightly, with the

aspiration of blood. This confirms the position of the point of the needle, and anæsthesia will not be satisfactory unless the solution is between the ends of the bone.

4. The needle is withdrawn, alcohol is applied to the puncture wound and a collodion or sterile dressing applied.

5. Twelve to fifteen minutes should elapse between the time of injection and the manipulation necessary for accurate reduction.

6. Reduction is carried out and plaster in the form of an anterior and posterior moulded slab is applied.

Routine treatment follows the reduction. The writer is able to recommend this method most highly.

VARICOSE ULCERS AND INSULIN

By L. G. PAYNE

Dresden, Ont.

Among the more common ailments met with in general practice varicose ulcers occupy no insignificant place, and the treatment, in their case, seems to be the all important angle for consideration.

Besides the several age-old measures used for their cure, such as rest, which, for the varicose ulcer means elevation of the leg, antiseptic powders and solutions, ointments of various kinds, and occlusion of adjacent veins, local treatment with insulin, has, I think, a very definite value. This treatment consists in applying to an ulcer cleansed with saline compresses and dried a small amount of insulin (usually U 20 strength) for approximately ten minutes. Following this, the insulin which has not been absorbed is removed, the base of the ulcer dried again, and the dressing, or elastic adhesive, applied. This, with elevation of the leg, will in many cases effect a cure even of large ulcers, within two or three weeks if the dressing is done every three or four days.

In those persons of younger age, or where the ulcer has a deep margin and fibrosed base, or in those for whom rest is less easily obtained, the insulin treatment seems less satisfactory, and in these seldom does anything short of injection or ligation of the regional veins suffice.

In the class of case where the ulcer is shallow, the patient older, or where rest with elevation of the leg is possible, the best results with insulin are obtained; the bluish epithelial margin quite often closes in a quarter of an inch on all sides per week, once the ulcer base has become healthy.

I have found that for the initial treatment, where the ulcer is almost invariably infected, a dressing of iodine dusting powder covered by elastic adhesive for three days is very satisfactory.

To conclude, it may be said that the above treatment with insulin is entirely empirical, the rationale unknown, but in those cases in which I have used it a marked improvement seems to have resulted.

Clinical and Laboratory Notes

AN ALBEE OPERATION AFTER 20 YEARS

By J. A. NUTTER, M.D.

Montreal

In 1917 a young woman, I.L., aged 27, was operated upon for Pott's disease of the 12th dorsal and 1st lumbar vertebrae. The diagnosis was confirmed by x-rays which showed a destructive process and well marked kyphosis. A bone graft taken from the tibia was used in carrying out the Albee operation, and the result was entirely satisfactory.



An x-ray plate taken in Toronto by the Gage Institute exactly 20 years after the operation is shown herewith. The bone graft appears very clearly indicated in the plate. The patient has remained perfectly well. She has married and has had a child, which was delivered by Cæsarean section.

The original operation was performed by the writer at the Montreal General Hospital, and the plate was sent him by Dr. R. I. Harris, of Toronto, who has recently seen the patient.

PNEUMONIA AS A CONTAGIOUS DISEASE

By HERBERT JOHNSTON

Montreal

Although isolation orders are routine in pneumonia, too seldom is it brought forcefully to our attention that we are dealing with an infectious disease. Only too often the history cannot state the exact point of exposure of the patient to the dangerous and contagious coughs of a carrier or of another case. The following notes show how six people developed lobar pneumonia by personal contact with infective persons.

(M.G.H., 7066-37) Mr. H.S., aged 32 a postman, developed chills with shaking and went to bed on December 10th. That night he had cough without expectoration, pain in the left chest on inspiration, and headache. These symptoms continued until December 12th, when he came to the Montreal General Hospital with pneumonia, which was found to be type I.

This man's wife, aged 28, who had had some degree of bronchitis since 1931, was kept awake most of the night of December 12th with a loose hacking cough with much purulent expectoration, but it was not until December 16th, a full six days after the onset of her husband's pneumonia, that she developed the signs of the onset of pneumonia, and when admitted to the Montreal General Hospital on December 21st it was found that she had type I lobar pneumonia. It is gathered from this that his wife developed the same type of pneumonia from contact with him.

The second story of the contagiousness of pneumonia is as follows. A mother (Mrs. W.K.) and her four small children all developed severe colds with coughs. Of these the mother and two children were sent to hospital with what turned out to be type I lobar pneumonia. Because the mother and two of the children were at the hospital a youth of 18 years was brought in as guardian of the two remaining children. This young man slept in a bed only that day occupied by one of the pneumonia patients and in the same room with the two remaining children who continued to cough frequently. The following day this youth developed the signs of

From the Medical Service of the Montreal General Hospital, by permission of Drs. Gordon, Montgomery and Ross.

pneumonia, and when admitted to the Montreal General Hospital it was found that he also had type I pneumonia.

We have, then, the story of how six cases of

pneumonia developed by close personal contact among people similarly infected with the type I organism. This leaves little to the imagination as to the contagiousness of pneumonia.

Editorial

THE SURGICAL TREATMENT OF CORONARY OBSTRUCTION

CORONARY obstruction, either partial or complete, is a relatively common disorder. Its initial treatment is in the main palliative, being directed towards relieving pain and combating shock. After the first few days our endeavour is to prevent extension of the process and cardiac decompensation. Coronary obstruction is, of course, referable in the final analysis to certain disorders of the blood and circulation, for example, toxæmia and high blood pressure, either, or both. Structural changes in the coronary arteries develop and their lumen is eventually encroached upon. Finally, as an end-result, from starvation, the heart muscle deteriorates. If the circulation in the coronary arteries is impeded gradually the changes in the myocardium arise insidiously and are generalized—disseminated fibrosis; if suddenly, as from thrombosis and complete obstruction, they are circumscribed—infarction, with myomalacia, fibrosis, or, occasionally, mural aneurysm.

Where we have a history of one or more coronary accidents it is natural to canvas the situation in the hope of maintaining an efficient circulation in the myocardium and so preventing trouble later on. This desideratum may be achieved, up to a point, by drugs and rest, but where these measures have done their best it becomes pertinent to enquire if some other line of treatment, in particular surgical intervention, may not be justifiable.

We used to be taught that the coronary arteries are "end-arteries", that is, that anastomoses between them are practically absent. This notion is quite incorrect. The work of the late Louis Gross, Spalteholz, and others has proved that the heart muscle is provided with a collateral circulation that is far from inefficient. It is nevertheless true that this circulation may

prove inadequate when it is suddenly and grossly interfered with, as when the main trunk or a major branch of a coronary artery becomes occluded.

The ordinary blood supply to the heart is provided by the coronary arteries, the thebesian vessels, and certain extra-cardiac anastomoses between the coronaries and the vessels in the fatty and connective tissues at the base of the heart. The anastomoses just mentioned are probably, under normal conditions, of relatively little importance, but in case of need, and given sufficient time, can develop new communications with the coronary arteries and other branches of the aorta, including the internal mammary, pericardial, phrenic, intercostal and oesophageal. It is worthy of note, too, that as people get older these various anastomoses tend to become more numerous and effective, so that in that proportion coronary occlusion, should it occur, is likely to be less damaging. Another observation, important in this connection, is that when adhesions form between the two layers of the pericardium blood vessels can be demonstrated in them¹.

In the light of these facts surgical intervention in cases of coronary occlusion, for the purpose of establishing an additional collateral circulation, would seem to be logical. And, as a matter of fact, during the last two or three years some promising work has been done in this direction. The initial inspiration came from a remarkable observation of Thorel's,² who reported a case in which complete occlusion of both major coronaries of long-standing was found post-mortem, the situation apparently having been saved by the occurrence of complete

1. MORITZ, A. R., HUDSON, C. L. AND ORGAIN, E. S.: Augmentation of the extra-cardiac anastomoses of the coronary arteries through pericardial adhesions, *J. Exper. M.*, 1932, **56**: 927.

2. THOREL, C. H.: Pathologie der Kreislaufsorgane, *Ergebn. allg. Path. u. path. Anat.*, 1903, **9**: 559.

concretion of the two layers of the pericardium. The work of Klose (1922), Moritz (1932), Leriche (1932-1934) and Lezius (1937) was also stimulating.

Beck started his investigations in 1932, and Beck and Tichy,³ working on dogs, found that after they had brought about by certain mechanical means adhesion between the two layers of the pericardial sac they could in some cases, by ligation of both coronary arteries, induce complete occlusion without causing death. Subsequently Beck operated on several human beings with some success⁴.

O'Shaughnessy,⁵ in England, working with cats and greyhounds to the same end, used a graft of a pedicle of omentum brought through the diaphragm. He first ligated the descending branch of the left coronary artery and then performed the operation of cardio-omentopexy. He found that the presence of such a graft was compatible with the high degree of physical exertion, the animals, after a suitable time, being able to course as well as before. Histological study of the tissues at the points of adhesion revealed the formation of new blood-vessels. Vascular connections were demonstrable in three weeks but did not attain their full development for at least a year.

Beck was the first to utilize these observations in the surgical treatment of coronary occlusion in the human subject. His operation⁶ consists in grafting vascularized fat and muscle on the heart. Skeletal muscle from the chest wall is used and fat from the mediastinum and also subcutaneous fat are available. In the earlier technique costal cartilages on each side of the sternum were removed, and a large graft of the muscle of each pectoralis major was applied to the right and left ventricles. The epicardium was removed to permit the grafts to come

in contact with the coronary vessels. The pericardium was roughened so that the pericardial fat receiving its blood supply from extra-coronary sources might become attached to the myocardium. In his later operations the approach was made only from the left side of the sternum, and a graft from the left pectoralis major was employed. Powdered beef bone was placed on the surface of the heart in order to produce a low-grade inflammatory reaction between the grafts and the heart. Procaine, applied directly to the heart was found valuable. In the later cases the mediastinum was drained into the left pleural cavity. Quinidine was used routinely before operation to reduce the irritability of the heart, and also after operation, if required. The patient was placed in an oxygen tent immediately after operation. The importance of these modifications of the original procedure is indicated by the reduction in the mortality; whereas in the first twelve patients operated on the mortality was 50 per cent, in the last nine it was nil.

O'Shaughnessy's operation is, briefly, as follows⁷. After suitable premedication general anaesthesia is induced and maintained with the Tiegel-Henle apparatus, which supplies oxygen under positive pressure together with vaporized ether. With the patient on his back the chest is entered along the fifth intercostal space by an incision extending from the mid to the anterior axillary line. The fifth and sixth costal cartilages are divided near the sternum after the manner of Kirschner, and the pericardium is exposed with the help of a large Sauerbruch intercostal retractor. The phrenic nerve is crushed with a haemostat; then the pressure in the anaesthetic apparatus is reduced from 10 to 6 cm. of water and the table is tilted to the right. As a consequence, the left leaf of the diaphragm presents, and after the insertion of two sutures the muscle is incised. Through this incision a suitable portion of the omentum is obtained and brought through into the chest. The opening through the diaphragm is then closed. The table is brought back to its original position and the degree of inflation of the lung is again increased. The pericardium is

3. BECK, C. S. AND TICHY, V. L.: The production of collateral circulation to the heart, *Am. Heart J.*, 1935, 10: 849, 874.

4. BECK, C. S.: The development of a new blood supply to the heart by operation, *Ann. Surg.*, 1935, 102: 801.

5. O'SHAUGHNESSY, L.: An experimental method of providing a collateral circulation to the heart, *Brit. J. Surg.*, 1936, 23: 665.

6. FEIL, H. AND BECK, C. S.: The treatment of coronary sclerosis and angina pectoris by producing a new blood supply to the heart, *J. Am. M. Ass.*, 1937, 109: 1781.

7. O'SHAUGHNESSY, L.: Surgical treatment of cardiac ischaemia, *The Lancet*, 1937, 1: 185.

cautiously incised and the graft is attached to the surface of the heart and to the edges of the pericardium with fine linen thread sutures. The chest wound is then closed in layers in the usual way.

Six patients were operated on by O'Shaughnessy with favourable results, with one exception. The patient in mind, however, died of an unrelated cause, namely, hæmorrhage from a duodenal ulcer. In no case was there any post-operative shock. This work has been followed up by Davies, Mansell, and O'Shaughnessy at the Cardio-

vascular Clinic, Lambeth Hospital, using four types of operation. Their recent paper should be carefully studied.⁸ These authors report 20 cases operated on, divided into two groups, 15 suffering from angina pectoris and 5 from other symptoms of cardiac ischæmia. In the first group there were 5 deaths and 8 of the surviving 10 are free of angina. In the second group one died and one is free of symptoms.

A.G.N.

8. DAVIES, D. T., MANSELL, H. E. AND O'SHAUGHNESSY, L.: Surgical treatment of angina pectoris and allied conditions, *The Lancet*, 1938, 1: 1, 76.

ANTI-PNEUMOCOCCUS RABBIT SERUM

THE report of the Massachusetts Pneumonia Study, in which 956 cases of that acute emergency, pneumococcus pneumonia, were treated by some 400 practising physicians with concentrated anti-pneumococcus horse serum, has clarified certain points about which there has not been universal agreement. The first is that the mortality from Types I and II infections, the only two types treated with specific anti-serum in this study, may be materially diminished, particularly if the serum is given early. And, secondly, that the use of anti-pneumococcus serum is not limited to large hospitals but may be given in the home. Early diagnosis is no longer a difficulty, since there is available a thoroughly tested rapid method of typing the organisms directly from the sputum. Regarding the value of treatment of pneumonias caused by the higher types with horse anti-serum, in a small series of cases of Types VII and VIII the results were satisfactory but not quite so good as in the case of Type I (Finland *et al.*¹ and Bullock²).

Anti-pneumococcus horse serum has thus proved its value in the treatment of pneumonia, yet it apparently has no effect on the complications, *e.g.*, empyema, etc. This and certain inherent characteristics of horse serum, namely, that serum sickness, chill and anaphylactoid reactions are relatively common, led Goodner and Horsfall to study comparatively anti-pneumococcus Type I

horse and rabbit serum to see how they differed, and, if such differences occurred, whether it might not be advantageous to use the serum of the smaller mammal in treatment of human pneumonias and their complications. Actually, these investigators found that Type I anti-pneumococcus rabbit serum differed immunologically in more than thirty distinct ways from Type I anti-pneumococcus horse serum. The main differences were: (1) unconcentrated rabbit anti-serum has a relatively high titre of mouse protective antibodies as compared with horse anti-serum; (2) the rabbit antibody is of small size as compared with horse antibody, from experiment, three to four times smaller; all other factors being equal, this would suggest a more rapid and effective penetration through the capillaries and into infected tissue; (3) when greater than optimum amounts of horse anti-serum are injected in the mouse protection test there is often no protection, a zonal phenomenon which has not occurred with rabbit anti-serum; (4) physiological amounts of lipoids—cholesterol and cephalin—do not inhibit the action of rabbit anti-serum as they do horse anti-serum. Besides this, the immunization of horses is slow and uncertain and high titres rare, the average being 500 units per c.c., as compared with 2,000 mouse protective units per c.c., in rabbits. This has led to the relatively costly procedure of concentrating horse anti-serum, in order to increase the titre per c.c., and also to remove as far as possible the substances responsible for the chill and allergic reactions.

1. FINLAND, M., TILGHMAN, R. C., RUEGSEGER, J. M. AND DOWLING, H. F.: *Am. J. M. Sc.*, 1937, 193: 59.

2. BULLOCK, J. G. M.: *ibid.*, 1935, 190: 65.

A report on the treatment of 22 cases of pneumococcus pneumonia with unconcentrated rabbit anti-serum by Horsfall, Goodner, MacLeod and Harris appeared in May of this year,³ and the results are sufficiently interesting to warrant detailed comment. Ten cases were Type I, of which 8 had bacteraemia and one of these an infected pleural exudate. All the patients recovered after serum administration; antibody was demonstrated in the pleural fluid of the one case mentioned above and no surgical interference was necessary. An average of 124 c.c., or 248,000 units, was injected, and the time interval after onset and before the administration of serum varied between 14 and 101 hours. There were 4 cases of Type II, one of which had bacteraemia on admission and 2 infected pleural exudates. One of these patients developed empyema, was drained surgically, and died five weeks later following rupture of a dissecting thoracic aneurysm. The others recovered, and the second case with the infected pleural exudate is worthy of individual mention as antibody of rabbit origin was demonstrated in the fluid after the serum was given. This point is extremely important in any discussion on the relative merits of horse and rabbit anti-serum in treatment, since Sabin was unable to demonstrate antibody in the pleural fluid of 5 patients with circulating antibodies, and the present authors state that a review of the literature has failed to reveal any instance of the presence of antibody in pleural fluid after intravenous administration of horse anti-serum. The average amount of serum used in the Type II cases was greater, *i.e.*, 231 c.c. Treatment was begun at intervals from 50 - 145 hours after the onset. Three cases of Type VII, one with bacteraemia, and 5 cases of Type VIII pneumococcus

pneumonia, 2 with bacteraemia, were successfully treated.

The summary of the results of treatment of the above 22 unselected cases of lobar pneumonia with unconcentrated rabbit anti-serum showed one death of a Type II case with bacteraemia and infected pleural exudate on admission. The remaining 21 cases (Types I, VII and VIII) recovered, although 11 had bacteraemia—even for a small series a remarkable showing.

The authors have been able to eliminate the chill reaction by special treatment of the serum, and by the use of 0.9 g. of acetylsalicylic acid before the serum is given, and recommend initial large doses to avoid the necessity of repeating. The only reactions have been mild serum sickness.

Should anti-pneumococcus rabbit serum prove its efficacy in a larger series of cases it is likely to be more widely used, since the cost of production should be less than that of concentrated horse serum. There is also the possibility that in other diseases where an anti-bacterial rather than an anti-toxic serum is desirable rabbit anti-serum may prove more efficacious than horse serum.

Since writing the above a translation of an article published in Denmark by Nissen⁴ has become available. Using only Type I concentrated horse anti-serum, he obtained a marked reduction in mortality in Type I cases (2 deaths in 27 cases serum treated, and 7 in 11 not given serum). He also draws attention to the apparent success of non-specific serum therapy, in using Type I serum in all cases of pneumococcus pneumonia. The number of cases is not large enough to be conclusive, yet it seems highly suggestive that 6 of 8 cases of Type III pneumonia treated with Type I anti-serum recovered, while all the 6 untreated cases died.

ARNOLD BRANCH

3. HORSFALL, F. L., GOODNER, K., MACLEOD, C. M. AND HARRIS, A. H.: *J. Am. M. Ass.*, 1937, 108: 1483.

4. NISSEN, N. I.: *Ugesk. f. Læger.*, 1937, 99: 825.

Editorial Comments

Canada's Constitution

While Canada's Constitution has permitted Canada to appoint Royal Commissions for the past seventy years, we have sitting now for the first time a Royal Commission to examine Canada's Constitution. "Confederation Clinic", it has been aptly called. Headed by the Hon. Newton Wesley Rowell, Chief Justice for Ontario, a commission of five representing all sections of Canada, and ably supported by eminent legal counsel and advisers is now engaged in listening to expositions from Provincial Governments, national associations, and other responsible bodies. It is doubtful if any Royal Commission in Canada has been called upon previously to perform a more important task than that to which reference is herein made. Family history, complaints, symptoms, pathology, etiology, therapeutics and preventive hygiene, all are passing in review and authorities from Halifax to Vancouver are making diagnosis and prescribing treatment.

At this date, it would appear that a successful issue to the labours of the Commission requires but a simple formula, namely, a plan which will reduce everybody's taxes (excepting the other person's) and, at the same time, make available to all sections of Canada all modern advantages of Government and social services. "We want to pay less and get more" would seem to be an appropriate slogan for the majority of the representations, but how pleasant it is to find at least one ray of sunshine peeping through the clouds.

The submission made to the Commission by the Canadian Medical Association, which we publish *in extenso* in this issue and which we urge all members to read, outlines plans and procedures calculated to save money and reduce taxes. While it will be observed that various recommendations are made calling for realignment of health services, it will be observed also that a word of caution is thrown in, suggesting that before Canada plunges into further expenditures in health matters a proper examination of all existing health services should be made. And it is our belief that a carefully planned policy of health protection for Canada, properly conceived and intelligently executed, can save many lives. The Royal Commission may be trusted to give most serious and thoughtful consideration to our submission, as the Chairman remarked at the close of its presentation that it was a document of great public interest and importance and one which would receive the Commission's earnest attention.

T. C. ROUTLEY

The Cyclotron

We publish in this issue a paper which departs a little from our usual selection of topics. Professor J. S. Foster, of the McGill Physics Department, has prepared for us an account of the new radiation apparatus known as the cyclotron which is to be set up at McGill. He refers to it as a powerful research tool of the physicist, and from that point of view alone it is of course exceedingly interesting. But, unfortunately, we cannot all follow the intricacies of radioactive research and this aspect therefore will only appeal to few of our readers. We can be and are directly interested in knowing something about the relationship between this new development in physics and the use of radium and x-rays in medicine.

In brief the cyclotron is able to produce radioactivity in such a substance, for example, as sodium. The question immediately arises: is this artificial radioactivity able to replace radium? Prof. Foster points out that at present it cannot, and there is little likelihood of its doing so in the near future. Radio-sodium falls off in activity to half its strength in 14.8 hours and continues to lose activity; so much so that it would be impossible to send a given quantity of it to any great distance without its losing much of its effectiveness even before arrival. Against this characteristic of course is the fact that the artificial radioactive active substances can be prepared at very much lower cost than native radium.

There are other possibilities and capabilities however in these products of the cyclotron. Many of the products can be injected into the blood stream, and an instance of experimental work in this direction is given in the work of Hamilton and Stone on leukæmia.

We may say then that there is at present no indication that the artificial radioactive products will soon replace the more stable natural radium in its present medical applications. But the subject is undeveloped, and contains most fascinating possibilities both in physics and medicine.

H.E.M.

Diet and Nutrition

In this issue can be found the first in the series of articles on "Diet and Nutrition" which we plan to publish in the *Journal* during the present year. It is from the pen of Dr. I. M. Rabinowitch and is of an introductory character. His subject is "Calories and occupation". Other topics which will be dealt with in due course are "Protein requirements in normal nutrition"; "The place of fat in the Canadian

diet"; "Vitamins in infancy and childhood"; "Iodine"; "Calcium"; "Iron"; and "Nutritional requirements in pregnancy". Probably there will be other papers. The series is intended to cover a subject admitted to be of the utmost importance to our people in such a way as to bring to the attention of the medical profession the most recent views in regard to diet and nutrition in a concise and easily accessible form. The busy man will appreciate this. There will be no necessity to consult weighty tomes and pages of statistics in order to get a working idea of the subject.

We are greatly indebted to the Association's Committee on Nutrition for the opportunity to publish such important matter. This Committee is composed as follows: Drs. F. F. Tisdall (Chairman), University of Toronto; G. B. Wisewell, Dalhousie University; L. N. Larochelle, Laval University; I. M. Rabinowitch, McGill University; John Wyllie, Queen's University; T. G. H. Drake and W. R. Campbell, University of Toronto; E. M. Watson, University of Western Ontario; L. G. Bell, University of Manitoba; and Heber C. Jamieson, University of Alberta.

A.G.N.

L'Union Médicale

L'Union Médicale has a unique place in Canadian medical journalism. It was founded in 1872 and it has had an unbroken existence under that title. No other Canadian journal can show that record, although our own *Journal* has a longer genealogy. It is to be noted also that *L'Union Médicale* has always been privately owned, and has not depended on any medical organization for its support.

We note that with the January number steps have been taken to incorporate another journal with *L'Union Médicale*. This is the *Bulletin de L'Association des Médecins de Langue Française de l'Amerique du Nord*, and this fusion forms the official organ of that Association.

This amalgamation gives a much wider scope to *L'Union Médicale*, with corresponding members not only throughout Canada but also in New England and Louisiana, reflecting of course its representation of French-speaking medical men in various parts of North America. This, as has been pointed out in the foreword of the first new issue, was the ideal aimed at by Dr. Rhéaume, the founder of *L'Union Médicale*.

We extend our best wishes to what is not a new venture so much as a reinvigoration of an

older one. We note particularly the new format adopted, in which the introduction of advertising amongst the reading matter is no longer permitted.

H.E.M.

Zeitschrift für Rheumaforschung*

The firm of Theodor Steinkopff, of Dresden, Germany, announces the appearance of a new journal devoted to the subject of Rheumatism. While we feel inclined to deprecate the multiplication of medical journals we have no doubt that the publication of a special journal devoted to the study of this disease can be amply justified. Rheumatism, in northern temperate climes, at least, is a widely prevalent disease; its complications, particularly as they involve the heart, are disabling, and heart and circulatory diseases take the first place in mortality statistics. The medical and social implications of rheumatism are of first importance, and it is not surprising, therefore, that the study of this disease is being more widely and intensively taken up.

The new journal appears with the collaboration of Th. Fahr, Hamburg; K. Frik, Berlin; G. Hohmann, Frankfurt-am-Main; P. Rostock, Berlin; R. Schoen, Leipzig; A. Slauck, Aachen; H. Vogt, Breslau, under the editorial direction of Geh. Sanitätsrat Dr. P. Köhler, Bad Elster, Prof. R. Jürgens, Berlin, Dr. H. Kaether, Berlin.

The new journal is designed to collect and centralize the now widely distributed literature on the subject of rheumatism, both in foreign countries and in Germany, in the hope that the knowledge, investigation and combating of the disease may be assisted.

A.G.N.

Corrigendum

We are asked to make the following correction in an item entitled "The Regina General Hospital", which appeared in the *Journal*, 1938, 38: 86. In line 10 first column, "Five chronic slight suppurative salpingitis which in his opinion did not require removal", should read, "Five chronic salpingitis (slight) which in his opinion (Dr. Paterson's) did not require removal". Also, in line 22, "There were two cases of membranous hyperplasia", should read, "There were two cases of membranous hypoplasia", etc.

* Zeitschrift für Rheumaforschung, Theodor Steinkopff, Residenzstrasse 32, Dresden, Germany.

Special Article

DIET AND NUTRITION

CALORIES AND OCCUPATION

BY I. M. RABINOWITCH

Montreal

"From the use of materials arise physical results, such as work. . . which we can express in heat units."—Voit.

Work cannot be performed without expenditure of energy. In fact, there can be no change of any kind without free energy, and energy does not come from nowhere; wherever it is active it must have been potential elsewhere. Man obtains his energy from his food. Expressed in terms of heat units, the average value of 1 g. of carbohydrate is 4.1 calories; 1 g. of fat yields 9.3 calories; and the energy value of 1 g. of protein is 5.3 calories. An appreciable portion of the protein molecule is, however, not completely oxidized by the human body. Its value, therefore, as a source of energy is only about 4.1 calories per g.

Normal adults of similar age, sex, weight and height, when at rest, and after having been deprived of food and fluids for twelve hours or more, show a remarkable similarity in their expenditure of energy. The chemical and physical changes which account for the expenditure of the energy under these conditions of rest and abstinence from food and fluids are generally grouped under the term "basal metabolism". Basal metabolism must not, however, be confused with the *lowest* metabolism; the energy expenditure during sleep, for example, is still lower. The so-called basal metabolism is, however, a valuable base-line for calculating the needs of the body under different conditions of activity in health and in disease.

The expenditure of energy by the body depends to a very large extent upon active protoplasmic mass and the greater part of this mass is in the muscles. When engaged in any occupation, therefore, the primary factor which governs the need for food is the degree of muscular activity—such factors as personal idiosyncrasy and the amount and type of food eaten are minor considerations. Women need less food than men, largely because they are, as a rule, smaller and less muscular. Their "man-value" has been estimated to be about 0.83 (Cathcart and Murray), though it has been also found to be as low as 0.7 (Abrahams and Widdowson).

Compared with the many variables which must be considered in estimating the requirements of such food elements as calcium, phosphorus, protein, vitamins, etc., determination of

the minimal and optimal caloric requirements for any given occupation is simple. Data of a variety of conditions of activity are now available (Atwater and Benedict, Becker and Hamalainen, Carpenter, Lusk, Rose, etc.). The following is an example of the necessary calculations to determine the average daily caloric requirements of a metal worker:

	Calories
8 hours at work at 240 calories per hour.....	1,920
6 " of sitting at rest at 100 calories per hour	600
2 " " light exercise at 170 calories per hour	340
8 " " sleep at 65 calories per hour.....	520
Total	3,380

This approximates very closely the consumption of food materials by factory workers in Canada (Langworthy). The reliability of such data is seen in the remarkable similarity of amounts of food consumed by different people engaged in the same occupation but in different countries. Thus:

Farmer in Connecticut	3,410
" " Vermont	3,635
" " New York	3,785
" " Mexico	3,435
" " Italy	3,565
" " Finland	3,785

The above calculations, though very useful, have their limitations. Even the basal metabolism of the individual is not fixed; like most biological reactions it may, and as a rule does, vary not only in different people but also in the same individual. "Standard" diets are, therefore, meant to be used, and should be used, as *guides* only and not as *fixed* rules. "Standard" diets are *probable* requirements only; they are based upon averages obtained from many observations. They are, therefore, statistical standards and may or may not, and need not necessarily, apply to the individual. This is a fundamental fact of importance in nutrition and cannot be emphasized too often. In individual cases body weight is the best guide.

The total intake of food is not the only factor to consider in estimating caloric requirements, even when the diet is adequate with respect to all of the other elements mentioned—vitamins, minerals and protein. Maximum muscular efficiency (ability to perform any occupation with a maximum economy of food) is influenced to an appreciable extent by the source of the energy. Fatigue, for example, may be due not to lack of food but to lack of carbohydrates; muscular work is performed most economically

when the greater part of the energy is derived from such food materials.

Physical efficiency may be improved in another way without increasing the total number of calories. To Haggard and Greenberg (Diet and Physical Efficiency, Yale, 1937) Industry owes a debt of gratitude. These authors have clearly demonstrated that diminished productivity, heretofore attributed to fatigue, may in reality be due to diet and overcome not by increasing the total amount of food but by more frequent meals; a fall in productivity in the late hours of the morning and afternoon may be controlled very appreciably by small amounts of food in the form of carbohydrate. The objection that the stomach has no opportunity to rest with such frequent feedings is met by these authors with the observation that there is no evidence that the stomach needs rest, or that it ever rests even when empty. Attention is drawn to the fact that convalescents, invalids, and sufferers from gastric ulcer are fed not at long intervals, to rest their weakened or diseased stomachs, but in small amounts at frequent intervals. It is *large* meals and not *frequent* meals that put a burden on digestion and cause lassitude and disinclination for thought or work. The work of these authors fits in with the marked improvement noted previously by the writer amongst diabetics soon after their diets were made more liberal with respect to carbohydrates, and when, in addition to the usual three meals a day, some food (the equivalent of 20 g. of carbohydrate) was given in the late morning and late afternoon.

Physical efficiency may be improved in another way without increasing the total number of calories, that is, by preventing hunger, or as Carlson put it, the accessory phenomena of hunger. Hunger is a sensation which arises from contractions of the musculature of the stomach. In the child these contractions may be sufficiently powerful to cause pain. In the adult, though not sufficient to cause pain, they may cause irritability, weakness and diminished ability to concentrate. A number of conditions cause hunger contractions aside from lack of food, and one is the degree of emptiness of the stomach. Fluidity of the food is, therefore, a factor. It is, for example, a well-known fact that fluid diets, though they may be very rich in calories, are not as satisfying as solid foods. Fluids and semi-fluids tend to leave the stomach almost immediately; carbohydrate foods remain for shorter periods of time than meats, and lean meats leave the stomach more rapidly than fatty foods. Aside from their direct effect upon the musculature (their ability to slow gastric mobility) fats are satisfying because they go into solution very slowly. One-half pound of steak is much more "satisfying" than one quart of milk, though the latter has about 100 more

calories. Water when taken on an empty stomach passes rapidly through the pylorus; when taken with food its passage is delayed. This explains to a large extent the pleasure of afternoon tea taken with toast.

It is possible to increase efficiency without increasing the calories in a number of other ways. There is, for example, an *optimum speed* for each occupation, that is, a speed beyond which the energy consumed is out of all proportion to the useful work accomplished. Walking to and from work is an example. Walking one mile at the slow rate of 2 miles per hour requires about 60 calories only; whereas, walking at the fast rate of 5 miles per hour, one mile consumes about 600 calories; that is, increasing the speed $2\frac{1}{2}$ times is so wasteful that the energy expenditure instead of being increased $2\frac{1}{2}$ times is increased over ten times. (Calculated from data in "Living Machinery", by A. V. Hill, Harcourt, Brace, 1927).

Occupation, diet and income are intimately related. The physician, with his knowledge of food values, may, therefore, be of assistance here also. At its best, the human machine is wasteful; the efficiency of human muscle is approximately 20 per cent only; in the untrained individual it may be appreciably less. Very little can be done about this inherent defect, but much may be done otherwise. A fruit jelly made of gelatine, the juice of one lemon, and a portion of raw fruit has a heat value of about 30 calories only—an amount of energy which a person weighing 150 pounds expends in about one-half hour during sleep. The plebeian bread and butter pudding, made of two slices of bread and butter, one egg, $\frac{1}{2}$ pint of milk and sugar to taste, has a fuel value of 500 to 600 calories—enough to meet about 25 per cent of the total daily expenditure of energy in sedentary occupations. About one-eighth of steak, as purchased, consists of fat. By removing this small percentage of fat, the steak loses about half of its fuel value. The caloric value of one ounce of clear fat pork is equal approximately to two pounds of cabbage, and one ounce of olive oil is equal in energy value to about three pounds of lettuce. Of eighteen different proprietary foods the compositions of which are known to the writer, and the fuel values of which range from 11 to 122 calories per ounce, not one may be purchased for less than eight times, and in one instance over one hundred times, the cost of similar food materials easily prepared at home.

Restricted in scope by the limit of space, the object of this article is to outline as briefly as was thought consistent with clarity some of the more important facts about caloric contents of diets—the different values of food materials; how energy requirements for different occupations may be calculated; the limitations of these

methods; and how physical efficiency may be improved without increasing the number of calories in diets. Examples are also cited of the importance of knowledge of caloric values of food materials from the point of view of eco-

nomics otherwise. When read in conjunction with the articles which are to follow in this *Journal* on the subject of nutrition, it is hoped that this outline will form a practical basis for the intelligent prescription of food materials.

Men and Books

COLONEL F. A. C. SCRIMGER, V.C.

By W. B. HOWELL, M.D.

London, Eng.

Francis Alexander Carron Scrimger was born in Montreal on February 7, 1880. He was the younger son of the Rev. John Scrimger, Principal of the Presbyterian College, Montreal. His mother's maiden name was Charlotte Gairdner. Both parents were of Lowland Scotch descent. He was educated at the Montreal High School and McGill University. When he left school to enter the Arts Faculty of McGill his parents took it for granted that he would study law after taking his B.A. degree. That he took up the study of medicine instead was largely a matter of chance. He spent one of the summer vacations of his Arts course with a geological survey in Manitoba. When the time came for the party to return, the cook was ill and could not be moved. It was therefore decided to leave someone behind to look after him. At the cook's earnest request Scrimger was the one chosen. It was a wise choice. The cook had the discernment to see that whatever happened, Scrimger would think first of him and last of himself. Scrimger was left with directions to apply hot fomentations. No one who ever knew him would need to be told that the fomentations were applied regularly, and applied hot. So hot were they applied that in the process of preparing them Scrimger's hands became painfully red and inflamed from repeated scalding. The cook recovered under his ministrations, from what Scrimger in later life thought was either typhoid or appendicitis. On his return home, Scrimger announced to his parents that he had made up his mind to go in for the study of medicine. He took his B.A. degree with honours in biology in 1901, and his M.D. in 1905.

At that time it was the custom at the Royal Victoria Hospital to fill vacancies in the house staff each spring with the men who had taken the highest standing in the graduating class of the year. Scrimger's standing at his final examination was not high enough to entitle him to a place, but he was nevertheless chosen through the influence of the late James Stewart, then Professor of Medicine at McGill and Chief Physician to the Royal Victoria Hospital. Scrimger spent four years on the house staff,

one of them on the medical side, two on the surgical, and one as admitting officer.

So completely was he engrossed in his work during these years that, although he was devotedly attached to his parents who lived only a quarter of a mile from the Hospital, he could only find time to visit them once every two or three weeks. This absorption was very characteristic of him, and was due partly to his rigid sense of duty to his patients and partly to his intense interest in his work. One of his duties as admitting officer was to appear in court and give evidence as to the condition while in hospital of patients who had had accidents and were suing for damages. The impression that he gave to people who did not know him was deceptive. His unassuming bearing, his thoughtful face, his spectacles, and his low voice, were suggestive more of the somewhat diffident student than that of what he really was, a man of action. Upon one occasion an attorney with a loud voice and bullying manner, who was cross-examining him, bawled at the future V.C., "Speak up, Dr. Scrimger, don't be afraid of me".

In 1909 Scrimger went to Europe for post-graduate study. He worked for some months under Professor Bier at Berlin. One of his friends meeting him at this time was shocked at his haggard appearance, and found that he was so engrossed in his work that he was neglecting his meals and not getting enough sleep. On his return to Montreal in 1910 he was appointed clinical assistant at the Royal Victoria Hospital, and demonstrator in surgery at McGill. In 1913 he was promoted to the position of associate in surgery at the Royal Victoria Hospital. He joined the Canadian Army Medical Corps in 1912, and was appointed medical officer of the Montreal Heavy Brigade of the Canadian Garrison Artillery. In the spring of 1914 he was promoted to the rank of captain. At the outbreak of war he went, as medical officer to the 14 Battalion, Royal Montreal Regiment, to Valcartier and afterwards to England. While in camp on Salisbury Plain he was taken ill with broncho-pneumonia, and his battalion went to France without him. However, very soon after his recovery, he managed by pulling wires to be sent to France where he was attached for duty to a base hospital at Wimereux. Three weeks later he was transferred to No. 2 Canadian

Field Ambulance. The second battle of Ypres was then beginning and Scrimger had his first experience of shell fire. He was with the Field Ambulance for a very short time before being sent to rejoin the 14th Battalion. From April 22nd to April 25th he worked among the wounded in an inferno of shell fire, oblivious of peril and the discomfort due to fatigue, to lack of sleep, to filth. On the 25th a group of farm buildings, one of which he was using as a dressing station was heavily shelled and caught fire. Scrimger directed the removal of the wounded, and carried one of them, Captain H. F. McDonald, to a moat where the two men lay partly in the water under the precarious shelter of a bank of earth which threatened any minute to slide down and overwhelm them. Scrimger crouched over McDonald to protect him from flying splinters of shell and from being buried alive. When the firing slackened, he went in search of stretcher bearers and had McDonald carried to a dressing station. In a diary which Scrimger kept for a short time, he says of the incident. "I got all the wounded out, among them a staff officer. We lay together at the side of a ditch while they poured in seventy-five six-inch shells, five within but fifteen feet of us, and we were half smothered in mud. I got a good deal of credit for the show and understand something may come of it." Something did come of it—the Victoria Cross.

Scrimger's behaviour during this time is not to be explained merely as that of a brave man rising to the occasion. It was a revelation of another side of his character. There was in him a rigidity, a fixity of purpose, which made him inexorable in going through with anything he made up his mind to do. Nothing inspired him to effort like opposition or difficulty. The German army might try to prevent him from doing his job; he would go on with that job until he had finished it or been blown to pieces.

He remained with the 14th Battalion until December 31, 1915, and was then sent to No. 1 Canadian General Hospital at Etaples. Five weeks later he was invalided to England for infection of one of his fingers which had to be amputated. After he recovered he was on duty in England for a year, and then, in March, 1917, was sent to No. 3 Canadian Clearing Station at Remy Siding with the rank of Major. During the summer and autumn of that year he worked incessantly, for there was hard fighting in front of Ypres. During the following winter the work was lighter, and Scrimger took to visiting the nursing sisters' quarters. His fellow-officers are said to have accused him at this time of being "almost human".

When the great German attack of 1918 began a shell fell among the huts occupied by the nursing sisters of the Clearing Station, but fortunately did not explode and no one was hurt.

Thereafter there was occasional shelling of the neighbourhood and the nursing sisters were sent to St. Omer. The commanding officer of No. 3 received orders to send a surgical team to reinforce a C.C.S. of the 5th Army, east of Amiens. Scrimger, now senior surgeon of No. 3, urged his commanding officer to send him and accordingly he was chosen to go. His team consisted, besides himself, of Captain W. G. Lyall, who acted as his anaesthetist, two operating orderlies, and a batman. One member of the team, Nursing Sister Ellen Carpenter, who had for some time been working with him in the operating room and had been sent to St. Omer, was called for on the way. The C.C.S. to which Scrimger and his team were sent was near Roye. The wounded were being brought in in great numbers, and the team worked incessantly for three days and nights. Then, as the Germans were rapidly advancing, all nursing sisters were ordered to withdraw, and he was left without his operating-room nurse. The work of the C.C.S. soon became that of a Field Ambulance dressing station. A little later its personnel was ordered to evacuate camp and proceed towards the base. There were still 40 to 50 severely wounded men who would have been left behind to fall into the hands of the enemy. This was more than Scrimger could stand, and he and his team and an Irish R.A.M.C. officer stayed behind. They carried the wounded to a neighbouring road which was crowded with retreating artillery, with ammunition and transport wagons, and begged accommodation for them. In time all were disposed of, some even being carried on gun carriages. Not till then, did he feel free to leave. He and his team walked off with the greater part of the equipment on wheeled stretchers. They even took with them their operating table. Their personal effects were left behind.

All the technical equipment of the C.C.S. fell into the hands of the enemy. By this time the thin line of infantry which was holding back the enemy was close to the camp. Scrimger and his team, wheeling their stretchers, walked to Mont Didier, a distance of twenty miles, arriving about midnight. They found there Nursing Sister Carpenter working among the wounded and the team was once more complete. There followed days when on their way further down the lines of communication they set up their operating table and worked over the wounded, sometimes in houses, sometimes in sheds, once at least in a field. Upon one occasion, in a village where the inhabitants were unfriendly to the British, Scrimger could not at first get accommodation for Nursing Sister Carpenter, so that she could get a night's sleep. Scrimger helped himself to a mattress in one house and carried it to another, the front window of which he burst open. He put the mattress on the floor

and there the nursing sister got her night's rest. There was nothing about Scrimger when he was thoroughly angry that encouraged argument or even discussion, though he did not lose control of his temper or raise his voice, and there was little change in the expression of his face.

In April, 1918, Scrimger and his team returned to No. 3 C.C.S. and his engagement to Nursing Sister Carpenter was announced. The wedding took place in September. After the honeymoon, Scrimger returned to France with the rank of Lieutenant-Colonel, and was for some time in charge of the surgical side of No. 3 Canadian General Hospital. Later, after peace was declared, he was for three months on the staff of the Plastic Surgery Hospital at Sidcup. He returned to Montreal in May, 1919, was demobilized and went back to civil practice. He was that year appointed assistant surgeon to the Royal Victoria Hospital. In 1934 he was advanced to the rank of surgeon, and in January, 1936, he became director of the Department of Surgery and Associate Professor of Surgery at McGill. He was appointed Surgeon-in-Chief of the Children's Memorial Hospital in 1934.

As the years after the War went by, Scrimger worked harder and harder. When he reached an age at which he would have been wise to take life easily, he was as unsparing of himself as he had been when he was young. His private practice steadily increased. More and more responsibility was laid on his shoulders at the Royal Victoria Hospital. He gave a great deal of time and thought to teaching and to preparing papers to be read upon medical subjects. He was appointed consulting surgeon to the Laurentide Pulp & Paper Company, and had often to motor at night to Shawinigan to operate, a distance there and back of about 200 miles. Many times his usual strenuous day's work followed a night spent in this way. The short holiday he took every summer at Bic, where he had a cottage, was almost as strenuous as his working days. His chief amusement there was sailing, his crew being his children and their friends; another was being his own stonemason and building additions to his property.

In November, 1934, he received sudden unmistakable warning that the time had come for him to stop overworking his body. On his way to a meeting of surgeons at Philadelphia when he was lying in his Pullman berth he was attacked by a sudden violent pain which extended from the region of the heart into the neck. He at once realized the significance of the pain, and reaching for his notebook wrote a message to his wife.

He then sent a telegram to his friend Dr. Eltinge at Albany, describing his condition. Dr. Eltinge met him at the station and took him in an ambulance to a hospital. He was brought

home shortly afterwards and for six weeks was kept at complete rest. He submitted to this treatment with characteristic thoroughness, but with self-forgetfulness, equally characteristic. On resuming his duties he continued to work too hard. He received no second warning. The next attack occurred on February 13, 1937, and after a few hours ended in death.

Scrimger was a man of unusual ability and character. He was a born surgeon. Sound in diagnosis, sound in judgment, he was a quick and dexterous operator. He had the power of making up his mind quickly, one of the most important gifts of a good operator; and he knew what very few surgeons know, when to stop.

He inherited the best qualities of his Lowland Scotch forefathers. He was a "quiet" man, to a certain extent "dour". His inflexible honesty, helped perhaps by his sense of the ridiculous, kept him free from even the slightest taint of humbug or snobbery. There was not an atom of laziness in his composition. It was this that led to his death at a comparatively early age, for he allowed his work to kill him. Though he had complete confidence in himself he was without conceit. He was never heard to allude to his V.C. nor to any of his other achievements during the Great War. No one ever practised his profession with less mercenary motives. A public patient got just as much of his attention as a private one. What faults he had were of the kind that the hosts of friends who mourn him would not have wished to see amended.

—(By permission of "The Canadian Who Was Who.")

THE POST HOC ERGO PROPTER HOC FALLACY IN MEDICINE

BY ROBERT DAWSON RUDOLF

Toronto

I almost feel that I should apologize for calling your attention to the subject of this paper, but surely it is an important one. Are we not all apt to assume too easily that because something follows something else it must be due to it? in other words that the forerunner is the cause of the aftercomer?

The difficulty of attributing a right cause to something is very great, and mistakes have led to all sorts of errors in diagnosis and treatment. As E. Graham Howe¹ says: "If we are to be accurate we must recognize not a cause but always a relationship, and the advantages derived from our knowledge of bacteriology have to some extent been outweighed and lost by the way in which it has been conceded an importance out of balance and beyond its due, by tending to ignore the vital factor of variations in the patient's immunity. . . It is today generally agreed in theory, although not always

recognized in practice, that disease is essentially an interaction between seed and soil, in both of which there is a convergence of a sequence of related events, from the association of which the effect is developed." When a man takes pneumonia the cause may be said to be the pneumococcus, or the chill which lowered his vitality and so allowed the germ, which may have been present in his upper air-passages for years, to act. The chill may have been due to his sleeping in a ditch, and the cause of his so sleeping may have been the alcohol that he had consumed at the local public house, and this unwonted excess may have been due to the fact that he had won a prize in the Irish Sweepstake, and so on. Which factor was the cause of the infection? There is no end to this game of seeking for the cause. As Howe² says on this point, "It is rather curious that the search for the 'first cause' should for so long have been regarded as scientific orthodoxy, when philosophy had already recognized the principle of the recurring decimal in what is described as the 'infinite regress', and Roman Catholicism had regarded it as a valid proof of the existence of God. There is no answer to the question, 'which came first, the chicken or the egg?' and there is no answer to the question of 'what is the cause?' except the somewhat unsatisfactory one, 'whatever may have been your original hypothesis'." It may be objected that certain factors are of vital importance, and that being run over by a 'bus really is the cause of a broken leg. However, this undesirable experience may be expressed more accurately, although at greater length, by describing it as an intersection of two time-sequences, in which the 'bus time-sequence crosses the leg time-sequence, with disastrous effects upon the leg. Cause is but a phantasy and a convenient fiction which knowledge may much more accurately bridge with the time concept. To quote from Marcus Aurelius Antoninus to himself, "Subsequents follow antecedents by bond of inner consequence; it is no merely numerical sequence of arbitrary units, but a rational interconnection. And just as things existant exhibit harmonious coordination, so too things coming into being display not bare succession but a marvellous internal relationship."

Diagnosis includes not merely the labelling of the condition but a search for the nature of it and for the cause or causes that may have brought it into being.

Fever and ague had been noticed by primitive peoples to occur most often in persons who slept near marshes and other collections of stagnant water. This was a correct observation. The hypothesis arose that the miasma that rose from such places was the cause of the disease (the name "malaria" means this). Then next that an evil spirit that dwelt in such mist entered the victims and was the cause of the trouble.

Here was an example of what logicians call the undistributed predicate. The native case seemed to be proved by the fact that when people camped above the mist they were less apt to be attacked. But of course there were other things near the water than the mist and now we say that the reason why people often escaped when they remained at an elevation is because the *Anopheles* mosquito does not fly high.

How often do we see some condition attributed to syphilis which is really due to some other cause? The patient gives a strongly-marked Wassermann reaction and therefore undoubtedly suffers from the results of venery (barring yaws, which after all has been called "stone-age syphilis"), but the ulcer that we find on the leg or the bronchitis from which he suffers may have no connection with this infection. During the Great War one frequently saw lesions diagnosed as syphilitic, with all the trouble that this entailed to the patients, because the Wassermann test was said (often on very insufficient evidence) to be positive, when the lesions were independent of this infection.

Most of us can recall the mistakes that we made when the von Pirquet skin test for tuberculosis was first introduced. It certainly denoted that tuberculosis was present, but we now know that the great majority of people have this in quiescent form. Tuberculous people may of course suffer from all the ailments to which flesh is heir. I recall the case of a young woman who had a persistent dry cough. Her doctor found a small pimple on one of the vocal cords and that the von Pirquet reaction was present. She was about to be sent to a sanatorium, when a laryngologist saw her and diagnosed and removed a simple wart with complete success.

Another case comes to mind where the undistributed predicate led to error. A woman well up in years was first seen in an apparently comatose condition which had followed some domestic argument. Her elderly daughters said that she often had such attacks when annoyed. I noticed as I walked about the room that her eyes would follow me, although when spoken to she seemed to be quite unconscious. I was told that when no one was about she would get up and go to the toilet. The case seemed to be a functional one, and the late Professor McPhedran who saw her with me agreed in this. But she did not improve and gradually became really comatose and at last undoubted signs of cerebral compression developed and she sank and died. The post-mortem examination showed a cerebral abscess. Here we were misled by the history and wrongly assumed that the whole condition was hysterical.

The *post hoc ergo propter hoc* fallacy was and still is constantly seen in military work and after accidents of all kinds. Of course, in some

of the cases there is an element of fraud, but in most this is not so. A man suffers from bronchitis. He was gassed in the war. Is the former due to the latter? A shell bursts in the vicinity of a group of soldiers. Most of them are unaffected and some may even treat the event as a grim joke. But a few suffer from so-called shell shock. How much had the explosion to do with their condition? A careful history often revealed the fact that they were potential neurasthenics, and the shock was only the last straw that precipitated the collapse. I recall a case of an old gentleman who was knocked down by a street car. He was kept in bed for a while, but did not recover, and finally developed symptoms and signs of gastric carcinoma from which he died. The company were sued by the estate for damages, the claim being that the cancer was due to the injury, and eventually compromised. The time-sequence of cancer of the stomach and that of the traumatism happened to cross, but there was no causal connection. Only last week I came across another example of this where a man died of cancer of the stomach, and his friends were sure that it was due to gassing during the war twenty years before.

It is in considering the results of treatment that one most commonly sees the fallacy that we are discussing. The satisfaction of the practitioner in his patient's recovery may well be tempered by the thought that the happy issue may be due to many other causes than his skilful treatment. These may be a legion—"the patient's natural capacity for recovery, possible changes of external circumstances, the advantages of an enforced period of rest, or the satisfaction of a relationship between the patient and the physician, which quite erroneously endowed the latter with the power and the wisdom which were not really his, but nevertheless afforded the patient a great deal of comfort and of courage."³

In ancient times treatment was at first empirical, and lower animals, who have quite a therapy of their own, never get beyond this stage. But man, being a thinking animal, started to theorise on the origin and nature of disease and its subsequent treatment, and has thus advanced, although many of his theories have led to all sorts of mistakes and extravagancies. He had empirically found that cinchona relieved fever and ague, and in this was right, but his theory that the trouble was due to an evil spirit and that cinchona acted as a spirit-scarer was wrong. It is interesting to note that if we replace the idea of an evil spirit by the modern one of an infecting agent how near the ignorant savage was to the truth.

In heart failure the patient is given digitalis and probably quickly mends, and we are apt to think that the drug was the cause of the improvement. Now, no one will for a moment

doubt the enormous value of foxglove in such cases but we are apt to ignore the good influence of rest and other factors. Recently Evans⁴ has elaborated this point. In cases admitted to hospital with symptoms and signs of heart failure complete rest with restriction of fluids, without any drugs, was followed by restoration of compensation, and, strange to say, by diuresis. Sir James Mackenzie constantly urged the value of these other factors that usually accompany the use of digitalis.

Think what a number of drugs that for years had an honoured place in the pharmacopœias have fallen by the way. All used with apparent success and then found to be inert, the good results having been sequences to other factors than the drugs. They have gone the way of human urine, fæces, mice, toads, the washings from the tombstones of saints, etc., all of which had their day.

Some years ago, at the time when the belief existed that calcium would check bleeding by lessening the coagulation-time of the blood, I heard a paper read at a medical society endorsing this view. In the discussion a member detailed several cases where hæmorrhage seemed to have marvellously ceased after medication, "but", he paused, and then went on to say, "by mistake I had prescribed sodium citrate instead of the calcium salt".

J. A. Ryle,⁵ Regius Professor of Physic in the University of Cambridge, recently wrote, "We are pessimistic sometimes, but often as hopeful as the untutored laity, and as slow almost to distinguish between the 'post' and the 'propter' in assessing the results of treatment".

One is frequently struck by the enormous differences in results obtained by different men using some similar method of treatment. It is often cynically said that nothing lies like statistics, but think of the number of factors involved, all of which may prejudice the results, or rather the sequences of the therapy; the type of infection and its virulence (which always tends to lessen as the epidemic proceeds), the age, the sex, the nationality, climate, and so on. It must always be remembered that the treatment is only one of the preceding factors involved. In such instances as the value of vaccination as a preventative of small-pox, of antitoxin in diphtheria, insulin in diabetes, liver extract in pernicious anæmia, and in many other cases, tables of statistics are extremely convincing. But often they are less so and may even damage the progress of therapeutics. The mistake usually occurs through deducing a rule from too small a number of instances—in fact arguing from the particular to the general. But even when the numbers are considerable great differences may occur. Thus, in the treatment of pneumonia in children, Hipple, Coldsmith and Freeman⁶ showed a mortality following the

intravenous use of mercurochrome of 5.7 per cent and one of 10.3 per cent in the controls—very convincing until one reads⁷ that the mortality rate in the London Hospital in 836 cases of the same disease in children, where only expectant treatment was employed, was only 1.7 per cent. In mortality rates from hæmorrhage in ulcer of the stomach and duodenum very different figures are given by different writers. These vary from 1 per cent, according to Eggleston in 95 cases, to 25 per cent, according to Chiesman, of St. Thomas's Hospital, in 191 cases.⁸

I will not further stress the uncertainty of figures, but merely repeat that the greater the number of cases employed, with efficient controls, the less the chances of error. What can one say of a statement made not long ago at a medical meeting by a practitioner who claimed a 100 per cent success in some operation, and when asked how often he had so operated he honestly admitted that he had done so only once!

Controls, as said, are essential in the investigation of any new treatment, and the difficulty is that when an apparently valuable method is discovered we are loth not to use it, when by omitting to do so lives may possibly be lost. This of course does not apply to animal experimentation, but there is a great deal of difference between the reactions of animal and man, and so the results can only be taken *cum grano salis*. The value of convalescent serum in the treatment of poliomyelitis anterior acuta is a case in point. The serum must be given very early before any paralysis has appeared, and the difficulty of diagnosis at this early stage is very great, even with the aid of spinal puncture, which after all is of no value in the first stage of the disease.⁹ Many cases that were not of this infection at all will be given the serum, and of course many of these patients do not develop any paralysis in any case. An excellent statistical study of this matter was that of W. H. Park¹⁰ where he tabulated 927 cases of the disease, 519 of which received the serum and 408 did not do so. Paralysis developed in 19.6 per cent of the former and only in 1 per cent of the latter. Also the mortality of the serum-

treated cases was 3.8 per cent as compared with one of 0.9 per cent in the controls. Last year W. D. Davison,¹¹ in a summary of the immense literature on this subject, wrote thus: "Many still believe that the serum has value when given intravenously or intramuscularly as soon as the first symptoms occur and before the onset of paralysis, especially in large doses of 100 to 300 c.c. and by transfusion. However, the evidence gained by treating alternate patients and by the observation of controls seem to show conclusively that no benefit is produced."

The natural history and course of a disease must be studied before we can gauge the value of any therapeutic measure. As a leader writer in *The Lancet*,¹² puts it: "Unless a practitioner makes a mental picture of the probable course of the disease, the course of treatment he prescribes may be unwise or at the best unnecessary. In the words of Hippocrates, he will carry out the treatment best if he know beforehand from the present symptoms what will take place later".

Thus, both in diagnosis and in treatment it is necessary that we go warily lest we be guilty of the fallacy of *post hoc ergo propter hoc*.

I would be sorry if it seemed from this paper that I were a cynic or a sceptic over medicine. I have far too great an appreciation of the enormous advances that have been made both in diagnosis and treatment for such a verdict, but *dubitando ad veritatem venimus*, which, being interpreted, means that by doubting we arrive at the truth.

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8. RYLE, J. A.: *ibid.*, p. 1069.
9. HANNAH, B.: Symposium on anterior poliomyelitis, *Canad. Pub. Health J.*, 1937, 28: 427.
10. PARK, W. H.: Poliomyelitis: The therapeutic use of antipoliomyelitis serum in preparalytic cases, *J. Am. M. Ass.*, 1932, 99: 1050.
11. DAVIDSON, W. D.: Poliomyelitis—résumé, *Am. J. Dis. Children*, 1936, 52: 1159.
12. Leader in *The Lancet*, 1937, 1: 1177.

COMPARISON OF MANDELIC ACID AND SULFANILAMIDE AS URINARY ANTISEPTICS.—H. F. Helmholtz avers that the introduction of mandelic acid and sulfanilamide has greatly improved the chances of curing urinary infections. Mandelic acid is dependent for its action on a concentration greater than 0.5 per cent and a pH of the urine less than 5.5, so that it is not likely to be successful unless the function of the kidney is normal or nearly so. The inability to reduce the pH of the urine of patients with *Proteus* infections makes mandelic acid therapy almost useless in the treatment of such infection. Its action on *Streptococcus faecalis*, however, makes it the antiseptic of choice for this type of infec-

tion. Sulfanilamide, because of its ease of administration and tolerance by the stomach, is the drug of choice, however, in the average case, and it has the added advantage that it can be used during the acute stage of the disease. Acting best in an alkaline urine, sulfanilamide should be extremely useful in treating infections of the *Proteus* group. Its striking ineffectiveness in the treatment of *Streptococcus faecalis* infections, however, is a definite handicap. These two drugs, one acting only in an acid and the other best in an alkaline medium, supplement each other, and they should be used in the treatment of urinary infections according to the type or types of organisms causing them.—*J. Am. M. Ass.*, 1937, 109: 1039.

Association Notes

**The Sixty-ninth Annual Meeting of the
Canadian Medical Association, Halifax, N.S.,
June 20-24, 1938,
Meeting Conjointly with the Nova Scotia
Medical Society**

The following preliminary announcement in regard to the speakers who may be expected deserves attention. The Presidential Address will be given by Dr. T. H. Leggett, Ottawa. The Osler Lecture on "Osler, the Last Phase, and his Influence on Medicine", will be delivered by Sir Humphry Rolleston, Bt., Surrey, England.

A Surgical Clinic on "Cancer" will be conducted by Dr. M. R. MacCharles, Winnipeg, and Dr. Wm. Boyd, Toronto. A Medical Clinic will be conducted by Dr. J. C. Meakins, Montreal. There will be a Symposium on "Poliomyelitis".

Among the visitors will be two speakers from England, whose names are not yet available, and, from the United States, Drs. Douglas Quick, New York; F. C. Irving, Boston; Eugene F. DuBlois, New York; Lincoln F. Sise, Boston; and A. W. Adson, Rochester, Minn.

The Canadian speakers whose names have been received up to date are the following: Drs. J. T. Phair, D. E. Robertson, M. R. MacCharles, Wm. Boyd, A. F. Miller, E. E. Cleaver, Fred McKay, Wesley Bourne, E. W. Lunney, J. C. Houston, L. C. Montgomery, G. F. Strong, A. H. Gordon, G. K. Wharton, J. H. Palmer, H. R. Clouston, A. F. VanWart, A. L. McLean, D. Nicholson, W. P. Tew, Ross Mitchell, E. V. Shute, John Fraser, P. J. Kearns, L. de V. Chipman, W. J. McNally, J. A. Sullivan, W. G. M. Byers, L. R. Teasdale, T. M. Sieniewicz, Geo. Campbell, A. P. Hart, J. E. Gendreau, W. A. Jones, E. H. Shannon, W. S. Barnhart, A. A. Fletcher, J. W. Merritt, Douglas Taylor, L. J. Austin, W. E. Gallie, Roscoe Graham, G. A. McIntosh, D. W. G. Murray, and W. O. Bigelow.

A more complete program will appear later.

It lies within the memory of most of us when the Annual Meeting of the Canadian Medical Association was a gathering of the male members of the profession. Few indeed were the wives who came with their husbands, looking forward to the gathering as a social event. Unless they had relatives or friends to entertain them, they sat about hotel corridors, "nursing their wrath to keep it warm", or relaxed by going on a shopping "spree", both sources of sadness to friend husband in the evening, who needed a cool hand to stroke his fevered brow, and enough money to pay his debts, just and

unjust. As for the children, large and small, they stayed at home as a matter of course.

In the words of the music hall ditty, "Those days are gone forever". We are planning that at the meeting in Halifax next June the doctor, his wife, and their children will have a glorious time. This old city was adapted by nature and by art as a playground. At our door is the sea; behind us a verdant countryside dotted with beautiful lakes and hills; within our gates are sporty golf links, and athletic clubs. All these natural and artificial sources of pleasure, relaxation and amusement will be drawn upon for your enjoyment. Just to give you an idea of what we hope to do, have a glance at our plans.

The North-West Arm, a beautiful inlet from Halifax Harbour, has on its sloping, wooded shores the Waegwoltic Club. This will be the headquarters for the entertainment of the juniors, and here they will hold a dance—a dance all their own. There are supervised facilities for bathing, swimming and diving, in salt water with a tang. On the grounds are excellent tennis courts and quoit beds, while the clubhouse affords the usual facilities for indoor entertainment. The young folk will enjoy this place, and mother and dad may go about their own amusements without a worry or care. Now and then the ladies will join them of an afternoon for tea and a share of the fun. In their turn, the young people will join the grown-ups on picnics at famous beaches and beauty spots.

If the ladies take advantage of all the activities the committee plans for them the days will not yield a dull moment. There are drives inland along the beautiful Dartmouth Lakes, and a coffee party will be held at a well-known summer inn on their shores. Those who are interested in sightseeing, in the study of sites where history was made, will find means to enjoy themselves to the utmost. Private yachts will be at hand to give you a taste of the sun and sea, and all who wish may have a voyage on the quiet inland waters of the Harbour, Bedford Basin and the North-West Arm. Peggy's Cove, the joy of the artist, will be visited. A garden party at Government House is planned. The golf links will have a special visit, with a tea and bridge. At the President's Ball, the ladies will have a chance to meet their husbands.

According to tradition the doctor will be fed with food for the mind and body *ad lib*. There will be lunches daily with speakers planned to entertain, instruct, perhaps amuse. In the evening there will be more food and more fun, so bring along your best liver. Of course after the serious business of the week is past will come the golf tournament, and a final wind-up which promises to be a benediction in itself.

Now, Doctor Jones, if the final argument is needed to convince you that you should attend

this Halifax Meeting, just pass over your *Journal* to Mrs. Doctor Jones, who with William Junior and his sister craning their necks over her shoulder as they read, will furnish it *instantly*. We hope you have not forgotten our advice to make your mind up and book your reservations early.

The Committee desires those intending to enter Scientific Exhibits to reply to the circular letter sent out, as plans must be made for featuring this valuable adjunct to the best advantage. We have reason to believe that they will be most instructive.

A Submission by the Canadian Medical Association to the Royal Commission on Dominion-Provincial Relations Canada, 1937

In the past the Canadian Medical Association has persistently advocated three national measures. First, a Federal Department of Health, whose sole business would be to look after the health of the people of Canada. Two, the acceptance of the principle that the medical care of the casually and chronically unemployed is a responsibility of the national government. Third, the appointment of a Royal Commission to investigate the whole question of medical services to the people of Canada.

At the meeting of the Executive of the Canadian Medical Association last October, it was decided that these matters should be placed before the Royal Commission on Dominion-Provincial Relations, and the Chairman of General Council and the General Secretary were instructed to prepare a brief for submission to this Body. Advice was sought and valuable suggestions came from every one of the nine provincial associations. The result is embodied in the following brief. It was sympathetically received by the Commission and the questions asked by the members showed keen interest.—[Ed.]

Coincident with Confederation the Canadian Medical Association came into being in 1867. There are nine provincial medical associations in Canada, all of which are affiliated Branches of the Canadian Medical Association; and, on behalf of the Canadian Medical Association and its nine Branches, and in the name of more than 6,000 Canadian physicians and surgeons, this brief is respectfully submitted.

The objects of the Canadian Medical Association may be recited in part as follows:

- (a) To cultivate the science of medicine and surgery.
- (b) To advance the character and honour of the medical profession.
- (c) To further unity and harmony among its members.

(d) To ensure the observance of legal duties and obligations imposed on the profession in medical matters by the different statutes or by the principles of ethics established by the Association.

(e) To promote the public health.

(f) To elevate the standard of medical education, both under-graduate and post-graduate.

(g) To assist in the advancement of medical education for the good of the public and the profession.

(h) To study and advance by any means within its power the improvement and standardization of hospitals.

(i) To conduct or assist in conducting research work in connection with the different medical problems that from time to time confront the profession.

(j) To serve humanity and the medical profession by investigation, study, and research work in connection with all matters in which the profession can properly interest itself and to do any necessary act or thing in the premises.

(k) To do such other lawful things as are incidental or conducive to the welfare of the public and of the medical profession.

The foregoing objects might perhaps be appropriately epitomized in the following words: "The promotion of health and the prevention of disease". It will hardly be argued by any thinking person that greater responsibilities or more important functions rest upon any group of Canadian citizens. As an organized body we are concerned with Canada's greatest asset, the health of her people. It would, therefore, seem appropriate that our voice should be heard by this Royal Commission, charged as you are with the grave responsibility of examining, diagnosing, and recommending treatment for, those ills of our people, be they economic, social or political, which, in your opinion require to be corrected or cured in order that the nation may enjoy health in the broadest conception of that word.

You have already heard and will no doubt continue to hear outpourings of symptoms, with their causes and suggestions as to cures. While there may be marked similarity in symptoms, you will no doubt find sectional divergences as to causes and recommendations as to cures, all of which will undoubtedly call forth the highest degree of diagnostic skill of which the members of the Royal Commission are capable. Rather than add to your heavy burden, we wish to introduce a concept of health responsibility which, we trust, will prove logical to you and receive emphasis in your final recommendations. Disease and ill health present exactly the same picture in Halifax as in Victoria. There are no municipal, provincial or Dominion statutes which in any way alter the problem of dealing with a case of diabetes or infantile paralysis or cancer, in any part of Canada. The broad question of health preservation gives rise to no sectional differences of opinion, and, therefore, as one voice, not as nine or ninety-nine, we are enabled to submit for your consideration the following observations.

RELATION OF BRITISH NORTH AMERICA ACT TO HEALTH

The British North America Act of 1867 gave certain rights to the parliament of Canada and to the provinces. The following extracts relating directly or indirectly to health have been taken from the British North America Act:

"Section 91—It shall be lawful for the Queen, by and with the advice and consent of the Senate and House of Commons, to make laws for the peace, order and good government of Canada, in relation to all matters not coming within the classes of subjects by this Act assigned exclusively to the Legislatures of the Provinces; and for greater certainty, but not so as to restrict the generality of the foregoing terms of this Section, it is hereby declared that (notwithstanding anything in this Act) the exclusive legislative authority of the Parliament of Canada extends to all matters coming within the classes of subjects next hereinafter enumerated; that is to say:

- 2—The regulation of trade and commerce;
- 3—The raising of money by any mode or system of taxation;
- 6—The census and statistics;
- 7—Militia, military and naval service, and defence;
- 10—Navigation and shipping;
- 11—Quarantine and the establishment and maintenance of marine hospitals;
- 12—Sea coast and inland fisheries;
- 17—Weights and measures;
- 22—Patents and invention and discovery;
- 24—Indians, and lands reserved for the Indians;
- 25—Naturalization and aliens;
- 27—The criminal law, except the constitution of courts of criminal jurisprudence, but including the procedure in criminal matters;
- 28—The establishment, maintenance and management of penitentiaries;
- 29—Such classes of subjects as are expressly excepted in the enumeration of the classes of subjects by this Act assigned exclusively to the Legislatures of the Provinces.

And any matter coming within any of the classes of subjects enumerated in this Section shall not be deemed to come within the class of matters of a local or private nature comprised in the enumeration of the classes of subjects by this Act assigned exclusively to the Legislatures of the Provinces.

Section 92—In each province, the Legislature may exclusively make laws in relation to matters coming within the classes of subjects next hereinafter enumerated; that is to say:

- 2—Direct taxation within the province in order to the raising of a revenue for provincial purposes;
- 6—The establishment, maintenance, and management of public and reformatory prisons in and for the province;
- 7—The establishment, maintenance and management of hospitals, asylums, charities and eleemosynary institutions in and for the province, other than marine hospitals;
- 8—Municipal institutions in the province;
- 14—The administration of justice in the province, including the constitution, maintenance, and organization of provincial courts, both of civil and criminal jurisdiction, and including procedure in civil matters in those courts;
- 16—Generally all matters of a merely local or private nature in the province.

Section 93—In and for each province, the Legislature may exclusively make laws in relation to Education

Section 95—In each province, the Legislature may make Laws in relation to Agriculture in the province, and to immigration into the province; and it is hereby declared that the Parliament of Canada may from time

to time make laws in relation to agriculture in all or any of the provinces; and any law of the Legislature of a province relative to agriculture or to immigration shall have effect in and for the province as long and as far only as it is not repugnant to any Act of the Parliament of Canada."

It will be noted that public health is not mentioned in the British North America Act excepting in so far as the above mentioned Sections quoted from the Act may be said to be related to public health. Public health as it is understood today, was unknown to the Fathers of Confederation, which no doubt explains why the Act fails to assign complete responsibilities in this field. It might be pointed out that Clause 29 of Section 91, quoted above, might be and indeed has been interpreted by some eminent legal authorities to mean that, as public health is not expressly mentioned as one of the classes of subjects for provincial control, it automatically becomes a subject of Dominion responsibility.

Because of differences of opinion as to legal interpretation of the British North America Act with reference to public health, the provinces did assume certain responsibilities in public health, and, up to the present, the Dominion authorities have shown no desire to interfere with what has been done. It does seem to us desirable, however, that the fields of responsibility in public health, as between the Dominion and the provinces, should be clearly defined.

PROGRESS SINCE CONFEDERATION

In order to understand how entirely the situation with regard to public health and the care of the sick has changed since Confederation, it would be wise to cite a few facts.

At the time of Confederation, the only diseases against which quarantine would be established, would probably have been smallpox, cholera, and bubonic plague. There was as yet no definite knowledge of the bacterial origin of disease. The whole mass of knowledge of the cause and preventability of infection in wounds, what we now call sepsis, still had to wait for Pasteur and Lister, and their colleagues and successors.

Maternal mortality was shocking, rising very high at times, even exceeding 25 per cent. The cause of child-bed fever was still unknown.

The cause, and hence the control of tuberculosis, was still unknown. As late as 1900 the considered opinion of an eminent authority was that tuberculosis was the cause of one-half the sickness and one-third of the deaths in Europe.

The origin of typhoid and its controllability were not known until twenty-five years after Confederation.

Only emergency surgery was done and the death rate in all surgical operations was very high, the chief cause of death being septic infection. Anæsthesia had not yet become possible.

There was absolutely no operative orthopaedic treatment for the crippled or deformed. The crippled children must remain crippled.

Practically none of the elaborate equipment which leads to the establishment of an accurate scientific diagnosis had yet appeared. The hospitals at the time of Confederation were little better than poor boarding houses for the bed-ridden sick and though the hospital authorities did all that they then knew, often with a spirit of self-sacrifice and utmost kindness, the condition of the wards was terrible. The hospitals of that time resembled the present institutions only in name. They still considered it proper and kind and as comfortable as could be expected to put two or three public ward patients in one bed. Modern sanitation was unknown. Naturally, the cost of operation of these institutions was low, probably averaging around 75 cents per patient per day.

Our knowledge of the nature of disease and of scientific diagnosis and treatment has increased more in this period than in the previous 500 years, and, naturally, the cost of providing these services has increased along with the increase of accuracy and actual value of the services rendered.

While under the British North America Act the provinces were charged with the establishment, maintenance and management of hospitals, asylums, etc., it did not necessarily follow that provincial jurisdiction covered the whole field of health, because in 1919 the Dominion Health Act was passed, which added to previous Dominion responsibilities in the field of health the following:

1. Cooperation with the provincial, territorial and other health authorities, with the view to coordination of the efforts proposed or made for preserving and improving the public health, the conserving of child life, and the promotion of child welfare.
2. The establishment and maintenance of a national laboratory for public health and research work.
3. The supervision as regards public health of railways, boats, ships and all other methods of transportation.
4. The supervision of federal buildings and offices with a view to conserving and promoting the health of the civil servants and other government employees therein.
5. The administration of the following Acts: the Quarantine Act; the Public Works Health Act; the Leprosy Act; the Proprietary or Patent Medicine Act.
6. Such other matters relating to health as may be referred to the Department by the Governor General in Council.

The Dominion Health Act goes further, as in Clause 4 the duties of the Minister are defined as follows:

"The duties and the powers of the Minister administering the Department of Health shall extend to and include all matters and questions relating to the promotion and preservation of the health of the people of Canada over which the Parliament of Canada has jurisdiction."

NEW PROBLEMS IN DISEASE

The Honourable Josephine Roche,* Under-Secretary of the Treasury in charge of Public Health for the United States Government, has published some interesting figures from which we quote:

"(a) Fifty years ago 94 per cent of all mortality from disease was from acute illness, chiefly infections. (b) Today, 75 per cent of all mortality from disease is from chronic illness.

Listed according to the death rates for which they are responsible, the ten most frequent causes of death are: heart disease; cancer; pneumonia and influenza; cerebral hæmorrhage; nephritis; tuberculosis; diabetes; diarrhoea and enteritis; appendicitis; syphilis."

While the foregoing statistics relate to the United States, it may be assumed with reasonable certainty that the figures will be applicable in a very large measure to Canada. Among the diseases quoted above should lie, to a large degree, the great future of preventive medicine in public health. It is obvious, however, that no appreciable improvement can be looked for until the sources of diseases are recognized and eradicated. This can only be done through preventive health work which—

1. Must include systematic physical examinations at all ages of life.
2. Must take into account living conditions, habits of life and economic conditions.
3. Must enlist every medical practitioner and all other health workers as part of the preventive forces of the country.
4. Must provide for adequate diagnostic and laboratory services to all the people in our country.

We submit that the program suggested cannot be effectively carried out unless it becomes a nationally supported undertaking, enjoying some measure of guidance and support from the Federal Government acting through a strong Federal Department of Health.

RECOMMENDATIONS

We, therefore, beg to suggest that the field of responsibility for the Dominion in health measures should include:

1. Those services now provided by the Dominion and for which the Dominion is legally responsible, as outlined in Section 91 of the British North America Act.

2. Public health leadership through the further building up of a staff of such competence and recognized ability within the Department of National Health that their advice will be sought and accepted. This would not require any change in the British North America Act, but it might imply a change in the point of view of the Dominion authorities, namely, a determination to give leadership and not to seek to avoid responsibility in public health by stating that

* *The Lancet*, Nov. 6, 1937, page 1097.

it is a matter for the provinces. Leadership would mean the planning of methods whereby all citizens would have the full benefits of public health services, and the devising of ways and means to make such plans effective, such as establishing standards for the qualification of health workers. That such a suggestion is feasible has been demonstrated by the United States Health Services which has no legal control over matters of public health in the individual states, but whose leadership is recognized throughout the country because of the merits of its staff.

3. The acceptance of the policy of making grants-in-aid to the provinces for province-wide public health activities, and, through the provinces, to local areas for local public health services. Such grants-in-aid should be given only when the province or the local area demonstrates its ability to do a worth-while piece of work, and, further, expresses its willingness to contribute to the cost in accordance with its own economic resources. Further, any such grants-in-aid should be contingent upon the piece of work being maintained according to standards for such work which would be established by the Dominion Health authorities. Grants-in-aid should be offered for specific pieces of work, for example, to encourage programs for cancer control, venereal disease control, tuberculosis control, mental hygiene, maternal welfare, child welfare, nutrition, health education, housing and sanitation. This suggestion calls for no change in the British North America Act, as the Dominion some years ago established a precedent by its grants-in-aid to the provinces for venereal disease control.

4. Contributions to assist in research and such investigation as is directly related to the public health would be in line with progressive development. The best results are often most readily obtainable through the support of such research in centres where proper facilities and staff are already available, rather than in the creation of new facilities. Competent authorities in the health field throughout the world are unanimous in their opinion as to the great need and value of medical research. A Medical Research Council, as a part of the National Research Council, which would be available to assist in medical research throughout Canada, should be established.

5. Financial support should be available for nationally organized voluntary health agencies in order that they may be assisted in their pioneer efforts in their various special fields, to educate the public, and to gain support for official public health developments in a way in which the official Departments of Health cannot proceed by themselves. When once a piece of work is definitely proved and established by a voluntary organization, it would then seem ap-

propriate for that work to be taken over and carried on by the official Public Health Department.

DEPARTMENT OF PENSIONS AND NATIONAL HEALTH

As previously indicated in this report, there was established in Canada in 1919, under the provisions of the Dominion Health Act, a Department of Health. Subsequently, it was merged with Pensions. We desire to offer the following observations and suggestions with respect to the Department of Pensions and National Health:

There does not appear to us to be any logical connection between Pensions and National Health, although it is recognized that both are of great national importance. It appears to us that national health suffers through being linked with a large spending department which must of necessity absorb the major portion of the time of the Minister and his Deputy. A cursory examination of the finances of the Department would indicate that, in outlay, Pensions represents more than fifty times the amount expended in Health. National Health should be big enough and important enough to stand by itself. Should it, however, not be found feasible for it to enjoy individual status, it is most desirable, and indeed essential, that it be headed by a full time Deputy Minister who, through qualifications and administrative ability, is competent to give direction to one of the most important phases of Government.

We believe, further, that consideration should be given to the inclusion in National Health of Public Health and medical care services now provided by other departments in the Federal Government. We are not suggesting at the moment that all such services should be transferred to the Department of National Health, but we do recommend that a careful examination as to the propriety of their being so included should be made, and, unless there is found to be good reason to the contrary, it would appear to be desirable that all government health activities be incorporated in the Department of National Health.

MEDICAL CARE OF THE CASUAL AND CHRONIC UNEMPLOYED

No man, woman or child in Canada today need be deprived of food, fuel, shelter and clothing. The Dominion Government, by subsidy to the provinces, has established this as a definite national policy. It is true that, while this may be regarded as a relief measure, particularly during the past few years of severe economic depression with its consequent unemployment,—it may be argued without fear of contradiction, that, so far as Canada is concerned in the future (whether speaking national-

ly, provincially or municipally) the provision of food, fuel, shelter and clothing to those of our citizens who cannot provide these essentials for themselves, is assured.

But, for those same unfortunate people, another necessity of life which, in our judgment, is just as essential as food, fuel, shelter and clothing, is medical care; and yet, for this necessity the Federal Government has assumed no responsibility, and, therefore, the provision of medical care to the unemployed and the indigent is in some of the provinces entirely inadequate, if indeed not entirely absent, the recipients of general relief being dependent for medical care upon the charity of the medical profession. It does seem to us illogical to say to an unfortunate individual or family, the Government will provide you with a house and fuel to keep you warm, clothing to keep you covered, and food to sustain you, but, if you have the misfortune to become ill, then you must take your chances of living or dying, because so far as the Federal Government's responsibility goes it washes its hands of the whole matter. It, of course, has been argued that medical care of relief recipients is a responsibility for the municipality. Such an argument, while perhaps technically correct, does not meet the situation because many municipalities, particularly in Western Canada where economic conditions during the past several years have been deplorable, are just as unable to provide medical care for their people as they are to provide food, fuel, shelter and clothing. It is a well-established fact in several lands that disabling illness among persons who are unemployed and on relief is very much higher than among a similar number of persons gainfully employed. On humanitarian and economic grounds, medical care of the unfortunate citizens who cannot provide medical care for themselves because of unemployment or indigency should be clearly defined as an obligation of the State, and certainly not as an implied obligation of the medical profession. While it is our opinion that this obligation should be assumed by the Federal authorities, that is not so much our concern as that a definite decision should be arrived at with regard to where the responsibility lies, and that adequate provision should subsequently be made for medical care to be provided along with food, fuel, shelter and clothing.

Now, having stated the broad principle of responsibility, to whom should this apply? In our judgment the State should be responsible for the provision of medical services to the unemployed, the indigent, war veterans receiving Federal Department relief, war veterans on War Veterans' Allowances, old age pensioners, mothers and their children in receipt of Mothers' Allowances. We cannot believe that the Canadian public either expects or desires the medical

profession to provide gratuitously for services which, obviously, are an obligation resting upon the State as a whole. Most respectfully do we suggest to this Royal Commission that, on the facts stated, it be recommended to the Federal Government that medical services for those referred to in this section of the report be made a responsibility of Government.

HEALTH INSURANCE

The world is looking for security. In order to achieve it, nations are uprooting old traditions and customs, overthrowing governments, spending billions of dollars, in fact doing everything and anything which in the opinion of those in authority will bring about something approaching an earthly Utopia where mankind may live in perfect peace and security. This quest envisages many changes, economic, social and political. Fortunate, indeed, is that country where sound thinking and leadership guide the people along the path of evolutionary changes, in contrast to the land where power and authority are the products of revolution. We are happy to think that we live in a land where sound thinking and statesmanlike leadership still prevail, and where those changes which may be necessary to provide better living conditions, greater protection, a proper share of the necessities and luxuries of life for all the people, will be the products of sound evolutionary progress.

In this forward march for social security there would appear to loom on the horizon a demand for health preservation which merits most earnest consideration. A great many people, both within and without the medical profession, are looking for a solution of the problem which will guarantee complete medical service to all the people on the principle of adequate payment for adequate service.

There are many students of sociology who claim that health insurance is the answer to the problem. The subject is one which has engaged the attention of the Canadian Medical Association for a number of years. Study committees representing all parts of Canada have had the subject under review most intensively. Our General Secretary, during the past year, visited several European countries expressly for the purpose of seeing health insurance in action.

Bismarck introduced health insurance into Germany in 1883. Lloyd George introduced health insurance into Great Britain in 1911. Health insurance is in operation in more than forty countries of the world, where benefits of proved value are available to middle-class persons. In considering the possibility of health insurance for Canada we find that there is no information available in our country at the present time showing—

(a) The feasibility or otherwise of establishing a national scheme of health insurance to provide adequate health services for those who cannot provide such services for themselves.

(b) Statistics of proved morbidity rates in the class of people who might be regarded as the population to be insured.

(c) The extent at the present time to which the class of people to be insured is inadequately served, due either to lack of available facilities or inability to pay for services.

On April 25 and 26, 1935, there assembled in Ottawa, under the Chairmanship of the Honourable Dr. Donald M. Sutherland, Minister of Pensions and National Health for Canada, the first meeting of the Ministers of Health for Canada, with the Ministers of all the provinces present or represented with the exception of Quebec. In addressing the conference, the Honourable Dr. Sutherland pointed out that it seemed to him that references to public health in the British North America Act were indeed vague. He spoke on public health at the time the British North America Act came into existence and compared it with the marvellous advances which had taken place between that time and the date of the conference. In further reviewing the activities of the Department of Health, he expressed the opinion that a worthwhile purpose would be served if a Royal Commission were appointed by the Dominion Government to make a survey of health matters in Canada. The Conference, in dealing with the proposal, received and passed unanimously the following resolution:

"WHEREAS the Honourable the Minister of Health for Canada has proposed to this Conference that a Royal Commission be appointed to examine into the whole question of medical services to the people of Canada;

AND WHEREAS such a Royal Commission would be in a position to secure information of great value to the people of Canada;

BE IT RESOLVED that this Conference approves of the suggestion of our Chairman that such a Royal Commission be appointed."

Subsequently, the Right Honourable R. B. Bennett, then Prime Minister of Canada, included in the speech from the throne a statement to the effect that the recommendation recited in the foregoing resolution would be implemented should his Government be returned to power. In the General Election of 1935, the Government was changed, and, to this date, no action has been taken on the recommendation.

At the Sixty-sixth Annual Meeting of the Canadian Medical Association, held conjointly with the American Medical Association in Atlantic City, N.J., June 10 to 14, 1935, the Canadian Association dealt with the subject of health insurance, and the following resolution was passed:

WHEREAS it has been brought to the attention of this Council that the Ministers of Health for Canada, meeting in Ottawa, proposed that a Royal Commission be ap-

pointed to make a survey of Canada in respect to the health services of Canada;

BE IT RESOLVED that this Council heartily approve of such a survey being made, and would recommend that the Commission be given the widest possible powers;

AND FURTHERMORE we respectfully submit that, before any scheme of health insurance be enacted in any part of Canada, it would be the part of wisdom to see that such a survey has previously been made.

There followed two additional resolutions which are recited hereunder:

1. That a copy of the above resolution be sent to the Provincial Medical Associations for their information, with a covering letter stating that, while the Canadian Medical Association has neither the desire nor the authority at this time to make any pronouncement for or against health insurance, Council feels that the above mentioned resolution would be of definite value to any part of Canada, as indicating the opinion of Council with regard to the principles underlying any possible plan of health insurance.

2. That the General Secretary be instructed to send a copy of the resolutions quoted above to the Honourable Minister of Health for Canada and to the Ministers of Health for the nine provinces.

It was further resolved as follows:

That, in the event of health insurance being initiated by any authority in any section or area of Canada the Canadian Medical Association endorse the principles governing a health insurance plan as laid down in the Report of the Committee on Economics, which we quote hereunder:

1. That in the provinces where health insurance is established it be administered under an independent Health Insurance Commission, and that there should be close cooperation between this Commission and the Provincial Department of Public Health, with a view to making full use of preventive services.

2. That a Central Health Insurance Board and Local Insurance Boards be appointed, representative of all interested to advise the responsible administrative authority.

3. That the professional side of Health Insurance Medical Service be the responsibility of the organized medical profession through the appointment of a Central Medical Services Committee and Local Medical Services Committees to consider and advise on all questions affecting the administration of the Medical benefit.

4. That the question of the establishment of local areas for health insurance administration be left to the decision of the individual provinces.

5. That the whole province be served by adequate Departments of Public Health, organized on the basis of provision of individual health supervision by the health insurance general practitioner.

6. That there be a Health Insurance Fund and that "Regional Officers", to act as supervisors and referees be appointed, paid and controlled by the Central Board or Commission.

7. That medical care for indigents be provided under the Plan, the government to pay the premiums of the indigent, who would then receive medical care under exactly the same conditions as the insured person.

8. That the Plan be compulsory for persons having an annual income below a level which upon investigation by competent local authorities proves to be insufficient to meet the costs of adequate medical care.

9. That the dependents of insured persons be eligible for the medical benefit.

10. That there be offered, on a voluntary basis, to those with incomes above the health insurance level, hospital care insurance, and that this be administered as part of the Health Insurance Plan, such hospital care

not to include medical service other than hospitalization.

11. That the only benefit under the Plan be the medical benefit.

12. That the medical benefit be organized as follows:—

(a) Every qualified licensed medical practitioner to be eligible to practise under the Plan.

(b) The insured person to have freedom of choice of medical practitioner and vice versa.

(c) The medical service to be based upon making available to all a general practitioner service for health supervision and the treatment of disease.

(d) Additional services to be secured *ordinarily* through the medical practitioner. (1) (a) Specialist medical service. (b) Consultant medical service. (2) Visiting-nurse service (in the home). (3) Hospital care. (4) Auxiliary services—usually in hospital. (5) Pharmaceutical service.

(e) Dental service, arranged direct with dentist or upon reference.

13. That the Insurance Fund should receive contributions from the insured, the employer of the insured and the government.

(a) Payment of the premium of the insured in certain proportions to be determined, should be made by the employee, employer and government.

(b) Where an insured person has not an employer or where it is not practical for the government to collect from the employer the government should pay in for that insured person what would be the employer's share as well as its own share of the premium.

(c) Where the insured is "indigent" or has been out of work long enough to come without the scope of the provisions of the Act as relating to an insured employee the government should assume payment of the full premium.

14. That the medical practitioners of each province be remunerated according to the method or methods of payment which they select.

15. (a) That the Schedule of Fees in any Health Insurance Scheme shall be the Schedule of Fees accepted by the organized profession in the province concerned.

(b) That all Schedules of Fees be under complete control of the organized medical profession in each province.

16. That the contract-salary service be limited to areas with a population insufficient to maintain a general practitioner in the area without additional support from the Insurance Fund.

17. That no economic barrier be imposed between doctor and patient.

18. That the volume of work demanded from and the remuneration to members of the various professions be such as to assure a standard of service equal to or better than present-day standards.

From the foregoing, the position of the Canadian Medical Association in respect to health insurance may be summarized as follows:

1. The Canadian Medical Association has not authorized an expression of opinion either in favour of, or opposed to, the institution of health insurance in Canada; but, in the event of some plan being proposed, the Association has set forth what it believes to be necessary guiding principles.

2. It is our opinion that, before health insurance is applied in any part of Canada, a survey, as recommended by the Honourable Minister of Pensions and National Health for Canada in 1935 and approved by the Conference of

Ministers of Health from the several provinces, should first be carried out.

We are in a position to state that, should such a survey be undertaken, or should constituted authority engage in any other study looking to a solution of the problem of the provision of medical services to the people of Canada, the Canadian Medical Association will be happy to render to such bodies as may be entrusted with the examination of the facts, all the facilities at its command.

RECOMMENDATION

We hope that this Royal Commission on Dominion-Provincial Relations may find it within its jurisdiction to recommend that a survey be made, as proposed in 1935 by the Honourable Minister of Pensions and National Health for Canada; before health insurance is undertaken either as a Federal or a Provincial matter.

CONCLUSION

In conclusion, the Canadian Medical Association desires to express its appreciation to this Royal Commission for the privilege of presenting this brief. In company with the vast majority of Canadian people, it is our very sincere wish that the findings and recommendations of the Commission may be productive of subsequent legislation which will carry our country a step further towards the realization of the ideals of the Fathers of Confederation, that Canada should in truth be a nation.

All of which is respectfully submitted.

GEORGE S. YOUNG,

Chairman of General Council.

T. C. ROUTLEY,

General Secretary.

Hospital Service Department Notes

Group Hospitalization

One of the addresses at the recent convention of the American College of Surgeons of interest to hospital staff members was that of Dr. C. Rufus Rorem, the well known authority on periodic prepayment plans for hospital care, who reviewed a wide range of medical experience and opinion on this subject. Enquiries were addressed to doctors having actual experience with these plans. He found from an analysis of replies that the doctors were practically unanimous that the development of these plans whereby, for a stated monthly premium, hospitalization without charge would be provided, did not interfere with the relationship of or to the physician. Some stated that relation-

All communications intended for the Department of Hospital Service of the Canadian Medical Association should be addressed to Dr. Harvey Agnew, 184 College Street, Toronto.

ships were improved, as more patients sought a private physician rather than enter the hospital on a free service.

There was some evidence of hastened recovery, due to lessened financial worries during hospitalization, and to earlier hospitalization with the removal of the cost factor. However, opinion varied. It seemed agreed that the quality of the service was unimpaired. With respect to the effect of these plans upon the collections of the doctors, opinion varied. Some thought that there had been no effect, while others were emphatic that the plans had increased medical collections because of the fact that, without a hospital bill facing the patient, it was much easier for the patient to pay the doctor.

Medical Societies

The Calgary Medical Society

At the regular monthly meeting of this Society, held on January 4th, the following program was presented: "The value of the intravenous urogram in urological diagnosis", Drs. W. S. Quint and F. Pilcher; "Some observations on fractures", Dr. D. S. Macnab; "A consideration of biological and psychological factors involved in the treatment of certain cases of pseudo-hermaphroditism", Dr. E. L. Holden Ellis; "Functional uterine bleeding", Dr. A. E. Wilson.

At a special meeting of the Calgary Medical Society held at the Holy Cross Hospital on January 25th, Dr. R. E. Buswell gave a most interesting address on a trip through Europe, "Six thousand miles by car", illustrated by movie films. This meeting was graced by the presence of members' wives. Supper was later served at the Glencoe Club.

Members of the Calgary Medical Society were invited to attend a meeting of the Young Men's Section of the Calgary Board of Trade on January 10th, to listen to an address of unusual interest by Colonel F. S. Dunn, Dean of the Department of Pharmacy at the University of Alberta, on "Chinese medicine". This was illustrated by numerous lantern slides. Colonel Dunn spent 1935 in China in research work in pharmacology.

G. E. LEARMONTH

The College of Physicians and Surgeons of Saskatchewan

At the annual meeting of the College of Physicians and Surgeons of Saskatchewan Dr. O. E. Rothwell, of Regina, was re-elected *President*; Dr. O. M. Irwin, Swift Current, was

elected *Vice-president*; Dr. J. G. K. Lindsay, Saskatoon, re-elected *Registrar*.

An honorary life-membership, the sixth in the college's list, was awarded Dr. Horatio Clarence Norquay, recently of Battleford but now residing in Winnipeg. He registered in the North-West Territories in 1898.

The next annual meeting will be held in Prince Albert at a date to be fixed.

The council decided to extend post-graduate facilities by the purchase of a motion picture projector and provision of films for use by the district societies in the province. During the past year considerable funds were used in providing post-graduate tours by leading clinicians from outside the province.

LILLIAN A. CHASE

The Montreal Physiological Society

GASTRIN.—S. A. Komarov. (Abstract of a paper read on October 10, 1937).

From the pyloric mucosa of dogs preparations were isolated which, when injected intravenously, elicited a gastric secretion with high acidity and low pepsin content in acute experiments on cats. These preparations did not contain histamine, choline or any other extractives, were not toxic, did not exhibit histamine- or choline-like depressor activity, and had no effect on pancreatic secretion. Preparations isolated in a similar manner from fundic and also from intestinal mucosa were without any effect on gastric secretion. It is concluded that pyloric mucosa contains a specific hormone—gastrin—which excites gastric secretion. Gastrin is a protein-like body which in its general chemical properties resembles secretin.

SOME COMMENTS ON THE PLEURAL LYMPHATICS OF EXPERIMENTAL ANIMALS AND MAN.—Hugh E. Burke. (Abstract of a paper read January 17, 1938).

Small quantities (0.25 c.c.) of colloidal thorium dioxide and finely divided lamp black injected into the pleural spaces of guinea-pigs remain, in part, on the pleura, and are, in part, conveyed to the extra-pleural parasternal lymph nodes and the retro-peritoneal para-aortic lymph nodes. A few experiments in which tubercle bacilli in suspension in isotonic saline were injected intrapleurally indicate that tubercle bacilli are also transported to the parasternal and the para-aortic lymph nodes.

Rabbits injected intrapleurally with small quantities (0.25 or 0.5 c.c.) of colloidal thorium dioxide and finely divided lamp black show deposits of these materials on the pleura and in the parasternal lymph nodes. X-ray and necropsy examination of the rabbits failed to reveal thorium dioxide and lamp black in other tissues and organs.

Examination of human necropsy material shows that patients who did not have pleurisy have minute parasternal lymph nodes and that those who had pulmonary tuberculosis and widespread pleurisy frequently have large tuberculous parasternal and para-aortic lymph nodes. These findings indicate that in man tubercle bacilli are conveyed from the pleural spaces to the parasternal and the para-aortic lymph nodes.

Studies are in progress to determine whether or not the transfer of tubercle bacilli from the pleural spaces to the parasternal and the para-aortic lymph nodes plays a rôle in the pathogenesis of spontaneous cold abscesses of the chest wall and tuberculosis of the lower thoracic and upper lumbar vertebrae.

EFFECTS OF ESERINE, ACETYLCHOLINE AND ATROPINE ON THE ELECTROENCEPHALOGRAM.—F. R. Miller, G. W. Stavsky and G. A. Wootton. (Abstract of paper read on January 17, 1938).

One hundred gamma eserine in 1 per cent solution applied to the motor cortex of the cat in dial anaesthesia augments the frequency of the waves of the electroencephalogram, at the same time reducing their amplitude. These changes coincide with contralateral muscular effects. One hundred and twenty gamma acetylcholine in 1 per cent solution applied to the eserinated cortex increases slightly the frequency of the waves, while reducing their amplitude. Twenty-six gamma atropine in 0.1 per cent solution applied to the eserinated cortex evokes in the electroencephalogram periods of intense hyperactivity which are synchronous with periods of muscular contractions in the opposite shoulder and thigh. The effects of eserine are attributable to enhanced, those of atropine to diminished, transmission at synapses. The results may be interpreted in terms of the hypothesis of acetylcholine as chemical transmitter at synapses. It is also conceivable that there is some other opposed synaptic action of eserine and atropine.

The Prince Albert District Medical Society

At the annual meeting of this Society Dr. George B. Bigelow gave a paper on "Extra-uterine pregnancy", with a report of a case. This paper appeared in the *Journal* (1938, 38: 174).

The following officers were elected for 1938: *Honorary President*, Dr. R. G. Scott, Wakaw; *President*, Dr. G. H. Lee, Prince Albert; *First Vice-president*, Dr. D. P. Miller, Prince Albert; *Second Vice-president*, Dr. Fahlman, Kinistino; *Secretary-treasurer*, Dr. E. A. Frejd, Prince Albert; *Executive*, Drs. D. G. MacQueen, Tisdale; B. H. Lyons, Birch Hills; G. B. Bigelow, Prince Albert, and I. C. Molony, Prince Albert.

The Saint John Medical Society

At the regular monthly meeting of this Society, Dr. C. W. McMillan, Local Medical Health Officer, delivered a very interesting paper on the recent epidemic of poliomyelitis. The speaker synopsised the literature of this disease as to history and symptomatology, and told of the research efforts made by a variety of investigators. He dealt with the various major epidemics, and outlined the special features of each, with the deductions which had been drawn by the medical groups who handled them. Dr. McMillan stated that the change in the definition of what constituted a reportable case has been partly responsible for the lowered case fatality rates of the more recent epidemics. For the same reason the case paralysis rates have shown a corresponding drop. It has been suggested that two epidemic diseases are occurring simultaneously, but coincidences repeated with such regularity appear unlikely. In the recent Saint John epidemic 67 per cent of the patients were under ten years, and one-third of the cases in the age-group five to nine; 55 per cent of these were in males.

Based on 112 cases selected for this analysis, the incidence rate was high, namely, 190 per 100,000 population. Of all homes involved 15 per cent had more than one case reported. In some of our cases (one-sixth of the total), where spinal puncture was done early, there was an increase in globulin only. Later, lumbar punctures in these same cases showed an increase in the cell-count. Seventy-five per cent of cases showed spinal fluid changes; 60 per cent showed changes in cells and globulin, and 15 per cent in globulin only.

Control measures consisted in prompt treatment of cases with immune serum, hospitalization, and complete rest. Surgical staffs controlled the cases with paralysis or paresis. The usual technique was employed for the care of communicable diseases. No hospital staff member became infected. Houses, where a case developed, were quarantined for two weeks; children were banned from school and public gatherings by proclamation.

Serum was given intramuscularly in 25 c.c. doses. In no case was this dose repeated. The serum was prepared in the Provincial Laboratory by Dr. R. A. H. Mackeen. There was no shortage of serum, due to the eagerness and readiness with which donors offered their blood. This local supply assured the freshness of the serum at all times. Twenty-seven per cent of the patients received serum within twelve hours of the onset of symptoms; 65 per cent within twenty-four hours; and 82 within forty-eight hours; only 18 per cent after forty-eight hours. The Department of Health knew of no contraindication to the use of serum, and as

there was no alternative treatment the Department recommended its use. The interval of time elapsing before administration of serum bears a definite relationship to the percentage making a complete recovery. In the Saint John epidemic group the paralysis rate was 12.5 per cent; the residual paralysis rate was 2 per cent, and eventually may be 1 per cent. Dr. McMillan commended the cooperation of the Medical Society, hospital staffs, Laboratory, donors and Health Officers, as an evidence of effective team work.

A. STANLEY KIRKLAND

The Saskatoon District Medical Society

This Society held its annual meeting on January 25, 1938, at the new quarters of the School of Medical Sciences, University of Saskatchewan. After dinner at Saskatchewan Hall the business meeting took place in the lecture room. The new officers for 1938 are: *President*, Dr. W. S. Holmes; *Vice-president*, Dr. B. R. Burwash; *Secretary-treasurer*, Dr. L. Schulman; *Executive Committee*, Drs. G. M. T. Hazen, H. E. Alexander, R. H. MacDonald.

Dr. W. S. Lindsay, Dean of the Faculty of Medicine, gave a summary of the activities of the School, which was followed by demonstrations by Dr. J. L. Jackson, Professor of Anatomy, and Dr. J. Fiddes, Professor of Physiology. The School accepts only twenty-four new registrants each year, selected from those having highest standing in the pre-medical course.

LILLIAN A. CHASE

University Notes

McGill University

The Board of Governors of McGill University announced the following appointments in Medicine on January 20, 1938.

Dr. A. T. Bazin, Professor of Surgery, becomes Head of the Department of Surgery.

Lecturer in bacteriology and immunology, C. D. Kelly, M.S.A., Ph.D.

Demonstrators in anatomy: F. S. Dorrance, M.D., C.M.; G. A. Holland, M.D., C.M.; W. J. Lafave, B.Sc., M.D., C.M.; Harry S. Morton, B.A., M.B., B.S., F.R.C.S., M.C.O.G.

Demonstrator in bacteriology and immunology: W. Gordon Stewart, B.A., M.D. Demonstrator in pharmacology and therapeutics: J. O. W. Brabander, M.D., C.M. Demonstrator in pathology: F. W. Grauer, B.S.A., M.D., C.M.

Demonstrators in medicine: Charles S. Baker, B.A., M.D., C.M.; William Cohen, M.D., C.M.; Louis Lowenstein, B.A., M.D.; S. Ortenberg, M.D., C.M.; J. M. Palmer, M.D., C.M., M.R.C.P.; Clifford Smith, M.D., C.M.

Other appointments were: Mrs. Eleanor H. Venning, M.Sc., Ph.D., Research Fellow, medical clinic; Mary Childs, M.D., C.M., medical officer for women.

Letters, Notes and Queries

St. Lawrence Fever

To the Editor:

In reference to Dr. H. E. MacDermot's note on "St. Lawrence Fever", which appeared in the November issue of the *Canadian Medical Association Journal*. We are indebted to Dr. MacDermot for having brought this matter to our attention in his usual accurate and pleasing style, and I cannot refrain from expressing thanks and also respectfully discussing this subject as it has been my lot to usually spend a part of the summer in the Lower St. Lawrence. I have therefore experienced this disease as a patient, and observed it as a physician for a good many years.

I cannot agree that the attacks are always recovered from within 48 hours, and it has seemed to me that some summers they were much more severe. I have seen this disease infect every person in a household of adults and children, and have had patients ill for two weeks with diarrhoea. My experience has been on the north shore, and in the Murray Bay environs, but I have also seen what I regarded as a similar disease in mountain resorts in the Laurentians. To me, clinically, this disease has been "bacillary dysentery", the severity of the symptoms depending upon which strain was present, for it is well known that while the Shiga and Flexner group cause the most pronounced symptoms there are a dozen other varieties such as the Hiss, Russell, Strong, Morgan, Sonne, etc., which cause mild attacks of dysentery. The organism gains access to the body by means of the gastro-intestinal tract, contaminated milk and water being the most frequent sources of infection; and the ordinary house-fly probably the most frequent cause of contamination. Cases occur, as a rule, during July, August and September; do not seem to be associated particularly with hot weather, but invariably are encountered at the time of year when the house-fly is abounding in swarms and the privies are full of faeces, which is often untreated and unprotected. It is easy to visualize the common house-fly in its purposeless peregrinations infecting small berries, such as raspberries and blueberries which are consumed with such relish by summer visitors; or another

Answers to letters appearing in this column should be sent to the Editor, 3640 University Street, Montreal.

source of contamination of these berries might be the not-too-clean French-Canadian child who often gathers and sells the berries.

During the last few years, with the boiling of the milk and water and stewing of all fruits consumed, except those capable of being peeled, and a careful protection of all foods from the common house-fly, the disease has been strikingly reduced in those families which have followed this advice.

The scientific proof that "St. Lawrence Fever" is in reality a form of bacillary dysentery will be difficult to establish without laboratory or hospital facilities, but the therapeutic results obtained have convinced me that sudden changes of temperature have very little to do with its occurrence, and the often astounding rapidity of cure might be ascribed to a suitable climate and low virulence of the organism.

Montreal, Que.,

HENRY P. WRIGHT.

December 16, 1937.

The Ill Effects of Dorsal Decubitus During the Puerperium

To the Editor:

For some time I have intended to draw attention to what seems to me to be a serious fault in our aftercare of puerperal patients. Some years ago I began the practice of routine examination of all mothers at the sixth week after confinement. I was surprised at the number showing poor position of the uterus and at the number of cases in which I had to do an actual reposition. No results were obtained from trying manual reposition in the knee-chest position. Finally no time was wasted, but at once ether was given, and with a large blunt sound I levered the uterus into position, packed the vagina with gauze, and kept the patient in bed four days. In nearly all cases this correction was permanent and the uterus remained in its proper position.

About two years ago it occurred to me that the cause of this displacement is one error and only one, namely, dorsal decubitus while the uterus is large and heavy with, in all probability, the bladder doing some harm by being allowed to overfill. I know it is the common practice to have these patients shift position frequently, but I am convinced that they should not lie on the back at all until involution is complete. The human animal is the only mammal which uses the dorsal decubitus, and so far as we know the human animal is the only one which suffers from backward displacement of the uterus. The other mammals use the prone and right and left lateral prone positions only, and I am sure this fact has a vital bearing on the matter. The great sloth spends practically his whole life

hanging upside down from the branches of trees, but I do not know what the female sloth does during her puerperium. It would be interesting to know to what extent the position of the uterus in this species has been changed during the evolution of this strange creature. One would expect the uterus to be retroverted by force of gravity during the perpetual dorsal position.

Since absolutely prohibiting use of the dorsal position and seeing that the bladder is emptied every six hours during the first four days I have not seen one backwardly displaced uterus requiring reposition in two years. I am thoroughly convinced that this displacement need never occur as a sequel to parturition. Once the reasons are clearly stated to the mother one can usually depend on her complete cooperation.

A. H. SINGLETON.

Rouleau, Sask.

The Surgical Thimble

To the Editor:

Surgeons are often asked, "Why do you not use a thimble?" To my tailor I replied, "Most of the time it would not be practical as a needleholder is necessary in surgery".

Speaking of thimbles, may I recall that in 1921 I saw Wm. Mayo manipulating with skill, a thimble.

If the needle were shorter the handling of a thimble would be facilitated: we all know that tailors always sew with short needles. I suggest that the thimble would aid speed and precision in: (a) intestinal work; the needle should be fine, straight, tapered and short (one and one-quarter inches), with atraumatic eye; (b) skin stitching, in face, goitre and even abdominal closure; the needle should be of medium weight, straight, cutting and short (one and one-quarter inches), with atraumatic eye.

J. BOULANGER.

Edmonton, Alta.,
December 30, 1937.

APHORISMS FROM LAVATER

Actions, looks, words, steps, form the alphabet by which you may spell characters.

He who reforms himself has done more towards reforming the public than a crowd of noisy, impotent patriots.

Where there is much pretension much has been borrowed; nature never pretends.

Trust him little who praises all, him less who censures all, and him least who is indifferent about all.

Abstracts from Current Literature

Medicine

Weil's Disease. Report on Seven Cases. Gaines, A. R. and Johnson, R. P.: *Arch. Int. Med.*, 1937, 6: 816.

The generally accepted conception of this condition has been too vague, since it is a definite entity with a known cause—rat infestation with *Leptospira ictero-hæmorrhagica* leading to human contraction of the disease. Clinically, there are three stages: (1) a febrile stage, seven days, with chills, intestinal upset, albuminuria, and other signs of acute infectious disease; (2) an icteric stage, seven days, with jaundice, cardiac weakness; (3) a convalescent stage, with anæmia and emaciation. *Leptospira* is present in the blood early, usually thinning out during the second week as antibodies come into action. During the third stage the organism is excreted in the urine in large numbers, also at this time a transient recurrence of fever is often noticed, cause unknown. Pathologically, there is inflammation of the duodenum around the ampulla of Vater; frequently closure of the common duct above its opening into the duodenum; liver reaction, varying from slight leucocytic infiltration to actual necrosis; and some congestive swelling of the kidney. Skeletal muscles sometimes show hyaline degeneration and necrosis. Hæmorrhages may be found in the lungs and other tissues, including the adrenals. The authors feel that this disease should be kept in mind in every case of jaundice not completely explained. Diagnosis must be based on either demonstration of the organism in the blood by dark-field examination, the same in the urine, the guinea pig test, or the demonstration of the presence of antibodies, especially the first two. Prophylactic treatment with immune horse serum has proved successful. Convalescent serum and immunized horse and goat serum are useful during the active stage. In spite of the fear of liver damage arsenical preparations have had a good effect in removing the *Leptospira* from the blood. Five cases are reported.

P. M. MACDONNELL

Hydatid Disease. Godfrey, M. F.: *Arch. Int. Med.*, 1937, 60: 783.

Found chiefly in countries where sheep are raised, since they are the intermediary hosts, sheep viscera are fed to dogs who contaminate pastures and water supplies. Iceland, Algiers, Bulgaria and many other countries have this disease as a problem, and more recently the situation has become very serious in Argentina and Uruguay, where the sheep industry has increased rapidly, and the labourers are unaware of the seriousness of the disease.

In man the liver is more often the seat of the disease than all the other organs together. The manifestations include dyspnoea and upper abdominal tumour, reaction to the escape of the fluid content as shown by urticarial rash, and sometimes fever, dyspnoea, collapse, and even death, if the fluid enters the blood stream.

The diagnosis is made by laboratory methods. The x-ray, also, has made accurate diagnosis possible in a great many cases; when a cyst dies the deposit of calcium can be brought out, also the presence of any quantity of fluid. In the liver where the right lobe is usually the seat of trouble x-ray shows elevation of the diaphragm with segmentation of its contour. The differential diagnosis is from hepatic abscess, malignancy, portal cirrhosis, syphilis and diaphragmatic adhesions.

The lung comes next in order of frequency. The usual cause is hexacanth embryos carried, more frequently, to the right lung. Their expansion may lead to the occlusion of a bronchus or there may be an opening into the bronchus through which the contents of the cyst drain. "Daughter" cysts may look like grape skins when coughed up. Subpleural cysts may require surgery. Differential diagnosis is from carcinoma, sarcoma, abscess, interlobar empyema, infarct, dermoid cysts, tetrosternal thyroid.

The other organs, kidney, spleen, bowel, brain, peritoneum and heart are also discussed, although they are seldom involved. The treatment by needling and surgical methods is mentioned.

P. M. MACDONNELL

Inheritance of the Shaking Palsy. Allan, W.: *Arch. Int. Med.*, 1937, 60: 425.

Only about a dozen families in which paralysis agitans appeared to be inherited have been reported in the literature. Allan examined 72 consecutive patients with this disease, and found that in 7 there was a history of probable encephalitis to account for it; in 20 there was nothing in the history to suggest its cause; and in 45 there was a history of near relatives with the disorder. In 24 of these the family history was fairly complete, and these pedigrees are given in the paper. Three men were affected to each two women. In several instances men and women with paralysis agitans have married twice, each time to unaffected partners, and have passed on to both sets of children their disease.

One of the pedigrees may be mentioned specifically. A man who left Scotland to settle in North Carolina married twice. By his first marriage he had 3 affected descendants in the next two generations. Eight times his normal descendants married partners who had paralysis agitans; in 7 of these marriages the

affected partner was a cousin. Six of these marriages produced affected offspring. By the second marriage of this Scotchman he had an affected son who also married twice. By the first marriage, this son had 8 affected descendants, and by the second, 15 affected descendants. In no instance in this pedigree was there a skipping of generations by the defect; the line of descent was always direct from parent to child.

In some of the pedigrees there is a skipping of generations, so that an unaffected person has passed on the disease to the children. But in practically all of these instances the parent who was free and passed it on died before the age of 50, so that had he or she lived, the disease would probably have shown up. In only 2 cases was the free parent who passed on the defect past the age of 50; 54, in one instance and 56 in the other. As shown by Patrick and Levy's table, only 45 per cent of paralysis agitans cases are affected below 50 years; 33 per cent between 50 and 60; 19 per cent between 60 and 70 and about 3 per cent between 70 and 80. Therefore, the pedigrees offered by Allan would suggest that the disease is due to a dominant factor, and that men and women transmit it about equally to both sexes.

MADGE THURLOW MACKLIN

Surgery

Malignant Tumours of Meckel's Diverticulum.

Nygaard, K. K. and Walters, W.: *Arch. Surg.*, 1937, 35: 1159.

The authors report a case of a malignant tumour of Meckel's diverticulum and review the literature on this subject. In the survey they found a total of 20 cases of this condition, 6 cases of carcinoma, and 14 of sarcoma. Of particular interest to pathologists was a patient with an adenocarcinoma growing in a tumour of heterotopic gastric mucosa. If this patient had continued to live without an operation, it would have, according to Gray and Kernohan, been only a question of time before the carcinoma had infiltrated the entire heterotopic gastric mucosa and left no trace of its origin in this tissue. A malignant tumour of Meckel's diverticulum may be present, for a time at least, without producing any clinical symptoms. When symptoms appear they fall into two main groups: (1) primary symptoms referable to the presence of the tumour; and (2) secondary symptoms referable to the perforation of the diverticulum, leading to localized or diffuse peritonitis or to invagination of the tumour together with the diverticulum.

Nygaard and Walter's patient, a man of 62 years, had a leiomyosarcoma of Meckel's diverticulum. He made a good recovery following the operation.

G. E. LEARMONTH

Discharge from the Nipple. Hicken, N. F. et al.: *Arch. Surg.*, 1937, 35: 1079.

An abnormal discharge from the nipple of a non-lactating breast is indicative of a pathological change within the ductal and secretory systems, yet it affords but scant information concerning the provocative factor. Conditions which produce confusing discharges fail to establish physical signs. All pathological conditions associated with a discharge from the breast must of necessity originate within or secondarily involve the ductal system. Any procedure which actually visualizes the lactiferous ducts should possess considerable diagnostic value. The authors present a method for visualizing the breast by means of contrast roentgenograms. A radio-opaque material, such as stabilized thorium dioxide, is introduced into the milk ducts by cannulating their orifices with a blunt No. 26 gauge needle. Stereoscopic roentgenograms then give an accurate anatomical pattern of the ducts. Any abnormalities, such as alterations in the size, shape or conformation of these ducts, can be detected readily and the causative agent identified. They have had experience with more than 375 contrast mammograms which has clearly demonstrated that they are invaluable in the diagnosis of lesions of the breast.

G. E. LEARMONTH

Fractures in Children. Bisgard, J. D. and Martenson, M.: *Surg., Gyn. & Obst.*, 1937, 65: 464.

This paper is chiefly concerned with disorders of the epiphyseal cartilages. These may be generalized, as in nutritional and vitamin deficiency and in abnormal functioning of the internal secretory glands, or they may be localized as a result of injury. In the latter case growth occurs in direct proportion to the vascular supply, although neurogenic and catabolic factors have direct effects. Arrest of growth results in shortening of the injured extremity, rotation and deviation from the normal plane of the joint surface. Trauma in reduction, infection, and fixation carried across the epiphyseal line are to be avoided. In this series deformities of clinical importance developed in 2.5 per cent of those under 16 years; these represent 12 per cent of those in whom the epiphyseal cartilage was involved, despite the fact that x-rays showed that 50 per cent of the cases failed to resume normal growth or manifested premature fusion of the epiphysis. Most of them needed no correction. A few were corrected by orthopaedic appliances, and the more severe by operative measures. The authors do not offer any other measures than those generally used for such deformities. Experimental work on goats is cited to substantiate their claims.

FRANK DORRANCE

Peritoneoscopy. Ruddock, J. C.: *Surg., Gyn. & Obst.*, 1937, 65: 623.

Despite the fact that this measure of chiefly diagnostic value has been available for 35 years it has not taken a place warranted by its importance, its low mortality rate (0.2 per cent), and its low cost in loss of time and hospitalization.

The author gives in detail his technique for operation. Distension of the peritoneal cavity was obtained by the use of atmospheric air. He insists on an operating table on which safe and easily changeable positions may be obtained. He finds an extensive knowledge of gross pathology is necessary for his speciality. Peritoneoscopy can be used frequently to replace diagnostic laparotomy, particularly in chronic abdominal cases of pelvic, stomach, liver malignancy, post-operative adhesions, and suspected neurosis with lessened accentuation of symptoms. Ruddock has obtained a diagnostic accuracy of 91.7 per cent in comparison with a clinical accuracy of 63.9 per cent. In 500 cases there were 9 accidents as a direct result; 8 of these were punctures of the bowel by needle or trocar all of whom recovered after operation, with one fatality from biopsy of a malignant condition of the liver.

FRANK DORRANCE

Hæmorrhagic or Traumatic Cysts of Mandible.

Ivy, R. H. and Curtis, L.: *Surg., Gyn. & Obst.*, 1937, 65: 640.

The majority of cysts of the mandible are lined with epithelium. The authors report 5 cases of cyst with no lining epithelium, following upon trauma insufficient to produce fracture but sufficient to produce hæmorrhage along the inferior dental canal with subsequent bony absorption. Dull pain and slight to moderate swelling of the mandible are sufficient to warrant x-ray examination. Aspiration of the contents might suffice, but wide opening and evacuation are diagnostic as well as curative.

FRANK DORRANCE

Obstetrics and Gynæcology

Heart Disease in Pregnancy. Lamb, A. E.: *Am. J. Obst. & Gyn.*, 1937, 34: 456.

The use of the functional classification for cardiac cases as the only guide as to whether women undergoing pregnancy will be able to withstand the strain of gestation and labour is not adequate. Other factors have to be considered, namely, the size of the heart, the presence of a long rumbling diastolic murmur at the apex in mitral stenosis, the signs of rheumatic activity, auricular fibrillation, and the duration of rheumatic heart disease. Only if each case is individualized and all the factors considered can an accurate estimation of the risk entailed be obtained.

ROSS MITCHELL

An Analysis of Three Hundred Consecutive Cases of Primary Cervical Repair. Wood, G. A.: *Am. J. Obst. & Gyn.*, 1937, 34: 606.

Primary cervical repair should not be practised unless one has obtained some experience in this type of surgery. This experience is not difficult to acquire. Strict asepsis is of prime importance, and only hospital equipment can provide this. Primary repair of the cervix is one more procedure in the practice of obstetrics that raises that practice to an art. Primary cervical repair offers a safe time-saving method of correcting or decreasing cervical lesions resulting from childbirth.

ROSS MITCHELL

The Conservative Treatment of Premature Separation of the Normally Implanted Placenta. Irving, F. C.: *Am. J. Obst. & Gyn.*, 1937, 34: 881.

Three hundred and fifty-three cases of premature separation of the placenta are reported; of these 234 had external and 119 internal hæmorrhage. In 170 patients delivered through the pelvis by simple means there were no deaths. In 30 cases of external hæmorrhage treated by Cæsarean section the death rate was 3.3 per cent; in 69 cases of internal hæmorrhage delivered by Cæsarean section the death rate was 14.5 per cent; in 34 cases of internal hæmorrhage treated by conservative measures the mortality was 2.9 per cent. Conservative measures give a better prognosis for the mother in both types of premature separation of the placenta.

ROSS MITCHELL

The Oral Administration of Paraldehyde for Relief of Pain During Labour. DeCosta, E. J. and Reis, R. A.: *Am. J. Obst. & Gyn.*, 1937, 34: 448.

Paraldehyde given in small doses of 4 c.c. every hour in gelatin capsules does not render the patient amnesic, is sometimes mildly analgesic, but is definitely sedative. In these doses it does not cause restlessness and seems to expedite delivery. As far as is known, paraldehyde is absolutely safe to the parturient patient and fetus in the varying doses used in this study.

ROSS MITCHELL

Biologic and Clinical Import of Vulvovaginal Mycoses. Hesseltine, H. C.: *Am. J. Obst. & Gyn.*, 1937, 34: 855.

A method requiring fewer office visits for treating vaginal mycosis is described. The vagina is painted with diluted Lugol's solution once a week, and the patient inserts two capsules containing potassium iodide and potassium iodate diluted with neutral kaolin. The term "diabetic vulvitis" is incorrect, since the condition is apparently a mycotic infection, and it is suggested that "mycotic vulvitis" or

"fungous vulvitis" be used instead. Glucose as such causes no irritation but produces a more favourable medium for the monilia and cryptococci. Every patient with mycotic vulvitis should be examined for diabetes mellitus, and every diabetic patient with vulvar symptoms should be examined for mycotic infection.

The similarity of certain stages of mycotic vulvitis to kraurosis is mentioned. It is suggested that the fungi produce the precipitating factor extrinsically for the tissue reaction, while in such diseases as kraurosis it may possibly be intrinsically liberated.

ROSS MITCHELL

Ophthalmology

Chalazion, its Real Nature and Association with Ametropia. Robert, G.: *Ann. d'Ocul.*, 1937, 174: 473.

In a recent article on this subject, Dr. Solignac mentioned that in 1933 Robert had drawn attention to the influence of ametropia on the development of chalazion. Since the publication of this article Robert has had time to verify statements made then, and he has arrived at the following conclusions.

The chalazion is a retention cyst, appearing always in eyes which show even slight ametropia. Even though large it will disappear in nearly all cases after a period of varying length, if we correct the ametropia. The chalazion should be cured by optical and medical treatment. It is not an organic tumour. The deformities and modifications of the secretory cells are not surprising when we consider the phenomenon of retention.

S. HANFORD MCKEE

The Prescribing of Prisms in Current Practice.

Hudelo, A.: *Ann. d'Ocul.*, 1937, 174: 528.

Ophthalmologists of different countries have studied from time to time the problem of heterophoria, that is, the subjective disturbance in the convergence-divergence function. In the last few years many authors, American, German, and particularly Landolt in France, have specially studied the question from both a theoretical and practical angle.

Hudelo takes up (1) what class of patients will benefit from this clinical examination; (2) the measurement of the convergent-divergent function, principles, technique and results; (3) clinical deductions; and (4) the result of examinations. Of 73 subjects studied 32 were troubled with convergent-divergent function for whom no prisms were prescribed; 7 were cured by prisms; 8 have not been seen again; 4 have had no relief; 17 have not been relieved by prisms, and this for various reasons. The treatment of emmetropia or slight ametropia is then taken up, and replies are given to certain possible objections.

S. HANFORD MCKEE

Ocular Symptoms in Olfactory Meningiomas.

Hartman, E., David, M. and Desvignes, P.: *Ann d'Ocul.*, 1937, 174: 505.

This article is based on the study of 16 cases which were all examined and followed in the service of Clovis Vincent. In all cases the diagnosis was verified by means of the microscope. In Vincent's service olfactory meningiomas represented about 13 per cent of the total number. Ocular disturbances form the most important symptoms of these. Their presence was noted in each of these 16 cases. They may be divided into alterations in the fundus of the eye, such as bilateral papillary stasis, 8 cases; primary bilateral optic atrophy, 3 cases; papillary stasis of one side, with oedema of the edges with papillary discoloration of the other side, 2 cases; normal eye, 1 case. The syndrome of Foster Kennedy was not noted in any case, but in 2 a variation of this was observed.

Section 11 takes up visual clearness, which is again subdivided into loss of visual clearness with ophthalmoscopic lesions; visual clearness and papillary stasis; and visual clearness in the Kennedy syndrome. Then are discussed in order, III, the visual field; IV, exophthalmos; V, the pupillary reaction; VI, corneal sensibility, and, VII, globe motility.

The author takes up the post-operative evolution of ocular symptoms, and in discussing the diagnosis states that the ocular symptoms here present may be observed in the course of other affections, particularly with certain meningiomas of the small wing of the sphenoid, tuberculous meningiomas of the sella, hypophysis tumours, gliomas of the chiasma, and ventricular distension.

S. HANFORD MCKEE

Urology

Some Observations on the Renal Capsule. Rolnick, H. C.: *J. Urol.*, 1937, 38: 421.

The renal capsule, unlike the capsule of other parenchymatous organs, is somewhat loosely but securely attached to the kidney parenchyma, and decapsulation can be performed without injury to the organ. The elastic fibro-muscular structure of the capsule permits it to accommodate itself rapidly to variations in size which may occur as a result of intrarenal tension. This elasticity and tensile strength are probably factors in preventing injury to the kidney. It has been demonstrated experimentally that where extensive trauma has been exerted upon the kidney the capsule often remains intact although the parenchyma may have been fractured. The capsule is a barrier to the spread of infection to and from the kidney. In infections involving the retroperitoneal space the perirenal capsule may be invaded and destroyed, but the true capsule remains intact and walls

off the kidney. Reference is made to personal experimentation which proves that there is a constant interchange of fluid on the kidney surface, provided by the extensive lymph channels. Besides many other functions this serves to provide a plane of cleavage between the capsule and the kidney. Decapsulation is to be considered harmful to the kidney. The new capsule consists of scar tissue only, which results in complete loss of the normal physiological function.

J. V. BERRY

Traumatic Injuries of the Bladder. Stevens, A. R. and Delzell, W. R.: *J. Urol.*, 1937, 38: 475.

While traumatic injuries of the bladder are not common, the subject has commanded attention in the literature from the days of Hippocrates. Bladder injuries are divided in two groups—ruptures due to blows or falls or compression, and perforations from without or from within the bladder. The commonest etiological factor is the overdistended bladder associated with injury, and the increase in hydrostatic pressure causes rupture in an explosive fashion. Alcoholism is probably the commonest associated factor. The empty bladder is fairly immune, except in instances where a spicule of bone, a bullet, knife or urethral instrument pierces the wall of the viscus. Spontaneous ruptures are reported where the wall is badly diseased. Rupture has occurred from explosion of gas during a transurethral resection of the prostate.

The diagnosis and treatment are rendered particularly difficult because of the frequent lack of history and outward evidences of trauma and the common association of other injuries.

The symptoms usually presented are low abdominal pain, inability to void, localized tenderness over the suprapubic region, and varying degrees of shock. Catheterization reveals bloody urine, and irrigation fluid usually cannot be recovered. Many symptoms may however obscure a ruptured bladder because of associated lesions to the bowel, pelvic bones, etc. The clinical signs and special methods of diagnosis are discussed.

J. V. BERRY

Neurology and Psychiatry

Extradural Hæmorrhage. Verbrugghen, A.: *Am. J. Surg.*, 1937, 37: 275.

The classical syndrome of extradural hæmorrhage is characterized by violence to the head with unconsciousness, followed by a return to consciousness for a few hours, and a subsequent return to unconsciousness. In a large percentage of cases, however, the classical syndrome does not appear, being masked by injuries to the underlying brain. It is probable that almost 50 per cent of massive middle

meningeal hæmorrhages are overlooked on this account. When the signs of developing extradural clot are obscured by injuries to the brain the gradual onset of hemiplegia with deepening coma and enlargement of the pupil on the suspected side are reliable guides. The behaviour of the person with an oncoming extradural hæmorrhage may be peculiar, in that he may seem confused, even violent, and he may have taken a drink or two to fortify himself. The unintelligible mutterings of an aphasic person who smells strongly of alcohol may easily lead to a mistaken diagnosis of "alcoholic" psychosis. The middle meningeal artery and its branches are by no means always the source of the bleeding, as more often the more vulnerable meningeal veins or cranial venous sinuses are its source. In some cases arterial bleeding may be so severe and the bleeding point deep and so inaccessible that it is necessary to ligate the external carotid artery in the neck. In cases where the diagnosis is in doubt a burr hole in the temporal region under local anæsthesia is not dangerous to the patient, and determines the presence or absence of an operable condition.

FRANK TURNBULL

Observations on a Case of Familial Periodic Paralysis. Aitken, R. S. and others: *Clinical Science*, 1937, 3: 47.

Periodic paralysis affecting many persons in a family has been known for some time. The paralysis usually comes on during sleep, and gradually passes off in a few days. It was thought to be occasioned by the eating of particular foods in some patients. The patient investigated by Aitken and his co-workers gave a history of a grandfather and father affected with the same condition. He associated the attacks with having eaten heartily, and so attacks were induced in him at will by the administration of large amounts of glucose. Investigation of the blood chemistry showed that during these attacks the blood serum potassium fell to very low levels. This value is normally lowered when large amounts of glucose are administered by mouth and the glucose passes from the blood into the tissues. The lowering was particularly accentuated in this patient with periodic paralysis. The patient could be brought out of the attack by the administration of potassium chloride until the blood potassium rose above 12 mg. per 100 c.c. of blood. It is supposed that the lowering of the potassium content blocks the neuro-muscular junction or inhibits the contractile response in the muscles affected.

Hereditary differences in metabolism are being added to, as chemical investigations are made on patients suffering from various diseases. Periodic paralysis, at least in the patient referred to, is added to this group of

metabolic anomalies. The treatment in the case reported gave striking relief of the symptoms.

MADGE THURLOW MACKLIN

Dermatology

Effects of Cholesterol in Petrolatum on Loss of Water by the Skin and on Cleansing. Jones, K. K. and Murray, D. E.: *Arch. Dermat. & Syph.*, 1937, 36: 119.

For persons whose skin is sensitive to soap and water some form of oil is the only means of cleansing. This is often the case in certain skin disorders and under conditions where excessive dryness or the necessity of frequent cleansing prevails. Cholesterol has a stabilizing effect on the emulsions present in skin, and this action tends to render the skin more or less impermeable to water. Petrolatum being bland and inert is particularly useful for protecting the skin from water and air. With cholesterol it can readily be emulsified even at an acid reaction.

One of the most important and readily measurable functions of the skin is the regulation of the body temperature through loss of water. The authors devised an ingenious apparatus for making comparative measurements of the loss during the use of petrolatum and other compounds, as well as their penetrating and detergent effects. From the results it was evident that when mixed in proper proportions cholesterol in petrolatum reduced the effect of petrolatum by decreasing loss of water from the skin and allowed more intimate contact with the cutaneous tissue, thus making the skin more penetrable and more easily cleansed. The proportions of the mixture were found to be important, the ideal being cholesterol in the proportion of 1.5 to 2 per cent. With 2 per cent cholesterol the mixture increased the cleansing efficiency of petrolatum by 1,200 per cent, and penetration was increased by 33 per cent.

D. E. H. CLEVELAND

Therapeutics

The Conservative Treatment of Gall-bladder Disease. Mock, H. E., Brown, C. F. G. and Dolkart, R. E.: *Surg., Gyn. & Obst.*, 1938, 66: 79.

With 850 patients complaining of upper abdominal distress the authors found that 28 per cent suffered with disease of the gall-bladder. They give statistics of other authors from 1,823 patients operated upon with unsatisfactory results in 30 per cent. The authors make a plea for more conservative treatment of gall-bladder disease, with and without stones. There are 5 fundamental conditions which demand consideration in the management of a case. These are: (1) stasis in the biliary tract; (2) infec-

tion; (3) the varying degrees of hepatitis accompanying the changes in the gall-bladder; (4) pericholecystitis with adhesions; (5) accompanying pancreatitis. They suggest a medical regimen of hourly feedings of milk and cream, to induce contraction of the gall-bladder; ketocholanic acid (the authors used that of G. D. Searle and Co.) to stimulate flow of bile from the liver; and the antispasmodics—Tr. Belladonnæ, minims 8, with phenobarbital, grs. 1½, 3 times daily. Rest in bed was often advisable. They advise medical treatment in gall-bladder dyskinesia, chronic cholecystitis without stones, and chronic cholecystitis with large, soft stones where attacks of colicky pains are infrequent. The authors urge consideration of cholecystostomy in cholecystitis with pancreatitis, with drainage for 6 to 12 weeks, in cholecystitis with cholesterol stones with a sound gall-bladder wall, and empyema of the gall bladder.

FRANK DORRANCE

Pathology and Experimental Medicine

Rôle of the Arteries in the Peripheral Resistance of Hypertension and Related States. Oppenheimer, E. T. and Priuzmetal, M.: *Arch. Int. Med.*, 1937, 60: 772.

This is an effort to discover whether changes in the arteries or arterioles are the cause of increased resistance in the condition named. The gradient of pressure from large to small arteries is investigated, the hypothesis being that a steep gradient in the systolic pressure would make the larger vessels responsible, and a reduced or normal gradient would put the blame on the smaller arteries. The pressures of the brachial artery and a digital artery were compared, a cuff (Gärtner capsule) being made to fit the finger with a rubber tube for recording the pressure on an ordinary blood pressure machine. The difference between the systolic pressure over the brachial artery and the digital artery was the same in a group of hypertension patients as in a group of normal controls. In cases of malignant hypertension the gradient was less. In a case of paroxysmal hypertension with increased epinephrin in the blood stream the gradient was extremely steep, obviously a result of the chemical agent. Cases with obstruction of arteries showed an increased gradient. Conclusion: medium and large-sized arteries do not play an important part in the production of peripheral resistance.

P. M. MACDONNELL

Recurring Myxomatous Cutaneous Cysts of the Fingers and Toes. Gross, R. E.: *Surg., Gyn. & Obst.*, 1937, 65: 289.

These thin walled structures, from 3 mm. to 1 cm. in diameter, filled with a colourless, gela-

tinous, viscid fluid, occur on the dorsal aspects of the fingers or toes, when in the proximity of the distal interphalangeal joint, on the dorso-lateral margin, or in the midline when not near the joint. They are rounded, elevated above the surrounding normal skin and may be faint yellow or faint blue in colour. Seventy-five per cent of the patients were women in late adult life. The etiology is unknown. The condition represents a localized degenerative (myxomatous) change in the deeper portion of the corium with later central liquefaction leaving a cavity without a lining membrane. Evidence of neoplastic growth is lacking. Many forms of treatment have been tried with recurrence, except in those patients who have had excision with x-ray therapy, 600 r.

FRANK DORRANCE

Obituaries

Hon. Dr. W. F. Roberts, Minister of Health and Labour in the New Brunswick Government, died on February 10, 1938. He was sixty-eight years of age, having been born on December 18, 1869. He was educated in the public schools of Saint John, and matriculated from the University of New Brunswick. He graduated in medicine from the Bellevue Hospital Medical College in 1894.

Dr. Roberts, from the first of his practice, enjoyed a very large clientèle and was extremely popular in his native city. He was deeply interested in politics all his life, and in 1917 was elected to the Provincial Government. In 1918 he established the Department of Health of New Brunswick, and was appointed Minister in charge of this department. He was the first Minister of Health in the British Empire, if not in the world. He remained in charge of this department until 1925, when his party was defeated. He returned to the Ministry of Health in June, 1935, in the government of Hon. Mr. Dysart. At this time the portfolio of Labour was added to that of the Ministry of Health. Dr. Roberts was directly responsible for the establishment of the Provincial Bacteriological, Pathological and Chemical Laboratory, which was opened by Dr. H. L. Abramson, an appointee of Dr. Roberts. In 1920 he established what has become a model department of vital statistics. It was largely due to his efforts that New Brunswick has been practically free from smallpox. Dr. Roberts established on a firm basis the medical examination of school children. At his instigation depots for the distribution of serum, vaccine and insulin, etc., have been established throughout the province. He was also influential in the establishment of venereal disease clinics, tuberculosis clinics, pre-natal and pre-school clinics. He placed the full power of his personality behind the movement to make pasteurization of milk compulsory in the province. He improved the regulations for the inspection of food. He was a member of many social orders, as well as being a member of the Kiwanis Club of Saint John. For fifteen years he was a commissioner for the City of Saint John. He was a Baptist and his church always held a very large place in his life. He was a teetotaler and an active agent in all temperance movements.

Dr. Roberts was the first physician to handle radium in a serious manner in New Brunswick, and will long be known for his work in physical therapy. He maintained a large clinic at his offices, and was

head of the Department of Physical Therapy at the Saint John General Hospital. He was a Past-president of the Saint John Medical Society, and a Past-Commissioner of the Saint John General Hospital. He was Past-president of the American Academy of Physical Therapy, and Past-president of the Canadian Public Health Association. He is survived by his wife and one son. Dr. Roberts will be remembered in history for the outstanding work which he performed for his city, province, and for Canada as a whole, in public health matters. In spite of being a successful politician, he was of retiring disposition, his family, practice, and church taking the greater portion of his interest, aside from his political affiliations. He was a staunch friend and a generous opponent. His monument is an improvement in living conditions in the province and an appreciation of the benefits of public health measures, which were established by his efforts.

A. STANLEY KIRKLAND

Sir Thomas Stanton, K.C.M.G., Chief Medical Adviser to the Secretary of State for the Colonies since 1926, died in London on January 25, 1938.

Ambrose Thomas Stanton was born in Kendal, Ont., on November 14, 1875, son of Mr. and Mrs. Thomas Stanton, of Pontypool. He graduated at Trinity University, Toronto (M.D., C.M., 1899). He served as house surgeon at the Hospital for Sick Children, Toronto (1899-1900), Toronto General Hospital (1900-01). He continued his studies at University College, London and the London Hospital. He held numerous diplomas: M.R.C.S.(Lond.), 1905; D.T.M.&H.(Cantab.), 1906; D.P.H.(Lond.), 1922; F.R.C.P.(Lond.), 1926; Hon. D.Sc.(Tor.), 1933. He was a Fellow of the Royal Society of Tropical Medicine and Hygiene, and a corresponding member of the Société de Pathologie Exotique of Paris.

In 1908, Sir Thomas became bacteriologist at the Institute for Medical Research, Kuala Lumpur, Federated Malay States, of which he became Director in 1920. In 1926 he was Bissett-Hawkins medallist at the Royal College of Physicians, and Mary Kingsley Memorial medallist at the Liverpool School of Tropical Medicine in 1929.

Sir Thomas was a recognized authority on tropical diseases and the author of a number of works on the subject. He was knighted in the King's birthday honours in 1934.

Some five years ago Sir Thomas married Dr. Elizabeth O'Flynn, specialist in children's diseases in Queen Mary's Hospital, London, England. She survives him, and there are no children.

AN APPRECIATION

Sir Thomas Stanton is dead. I see it, printed in large type, in the newspaper before me. Like lightning my thought travels back through the years, noting the honours which came to him; the Knighthood granted by our late King George the Fifth; the foreign decorations so well deserved; the Doctorate of Science bestowed by his Alma Mater, our own University; until it halts on a day when we were only grown-up lads.

I have many memory-pictures of Ambrose Thomas Stanton, but none more vivid or more cherished than this one. It was a heavenly day in the autumn of '94. The country road from Kendal to Orono was a panorama of beauty. We had driven slowly, my uncle and I, over those hills of Clarke, and came through an avenue of brilliant maples to the cross-road at Kirby. A hundred yards to the north stood the frame village school-house. From it came the teacher, slowly ambling down the path on his bicycle. It was Stanton, and through all these years the picture of that charming young man has haunted my memory. His dreams were to come true. He came up to college that winter, and I took his place as teacher in that village school. Two years he had

taught; two years I taught; then followed him again into old Trinity.

All this long time our friendship has stood. For many years I have had only an occasional letter, but always I think of his happy boyish smile, which never faded, of his merry wit, which never dimmed, of his charming manner, which never altered.

Many worldly honours came to him and he deserved them all, for he accomplished much for others. But by us, who knew him long ago, Ambrose Stanton will be happily remembered, not for what he achieved but for what he really was.

F. C. TREBILCOCK

Dr. James H. B. Allan died in Montreal on January 26, 1938, at the age of 75 years. He was born in Montreal, the son of the late James A. Allan, lumber merchant, and graduated in medicine from McGill University, and continued his studies and research work in Scotland and Austria. He practised only a short time in Montreal.

Dr. Charles Hewitt Amys, of Peterborough, Ont., died on January 19, 1938. Born in Lakefield, Ont., in 1872, he received his preliminary education at the Grove School, Lakefield, and the Peterborough Collegiate Institute. He graduated from Queen's University, where he won a scholarship in medicine and surgery with honours in 1899.

After spending a year doing post-graduate work in London, Eng., he began practising in Peterborough and resided there since. He was Medical Officer of Health for a number of years during the Great War and also served for a long time in a similar capacity for the village of Ashburnham before it was incorporated with Peterborough. He is survived by his widow; one daughter, Mrs. T. C. Thompson, of Montreal; and four sons, John Hewitt, Toronto; Roger H. and Spencer H., of Peterborough.

Dr. J. Albert Beauchamp, of St. Cesaire, Que., died on January 14, 1938, in his forty-third year. He was born in St. Telesphore and educated at Rigaud College and at the Université de Montréal (M.D., 1921).

Dr. Theodule Bruneau, of Montreal, died on February 9, 1938, in his sixty-fifth year. He was born in Montreal on July 11, 1873, completed his medical course at Laval University of Montreal, and later spent several years as an intern in Paris hospitals. Beginning his practice in 1900 he soon became director of Hotel Dieu clinics and a member of the faculty of medicine of the University of Montreal.

Dr. George Fisk, of Montreal, died on January 28, 1938, in his seventieth year.

Dr. Fisk was born at Abbotsford, Que., and received his M.D., C.M., from the University of Bishop's College in 1894. He also had an *ad eundem* M.D., C.M., from McGill. He was attached to the old Western Hospital and in later years with the Women's General, Montreal. He was the first to introduce the violet-ray lamp in Montreal. In addition to his practice he was medical referee for Canada of the Mutual Life Insurance Company of New York. He was buried at Abbotsford, the home of the family. The Anglican church there was founded by his grandparents.

Dr. Fisk's activities were not confined to the medical profession. He was one of the founders of the Boy Scout movement in Canada, organizing one of the first troops here in 1908. He served for 20 years as medical officer of the St. George Troop.

During wartime he was corps surgeon for Canada of the St. John Ambulance Corps. He went to Halifax in 1917 to attend the wounded in the explosion there. He was awarded the long service medal of the corps in 1930 and the medal with bar in 1935. He was made a member of the American College of Surgeons in 1918.

Dr. Fisk is survived by his widow, formerly Miss Mary Jane Savage, two sons, George Harold and Donald C. Fisk, of Montreal.

Dr. Maxwell Stephen Inglis, a retired physician, died in Vancouver on January 20, 1938, aged seventy-four. Dr. Inglis was born in Montreal and a graduate in medicine of the University of Manitoba (1891). He was also L.M.C.C. (1920). He served overseas in the Great War in the C.A.M.C., and at one time was a provincial coroner in Manitoba.

Dr. David C. Johnston, of St. John's, Newfoundland, died on January 8, 1938. He was born in 1903 and graduated from Pictou Academy in 1925 and later from Queen's University in 1931. He is survived by his widow, the former Miss Muriel MacKenzie, R.N., and their three year old son, Douglas.

Dr. Joshua N. Mack died at his home in Halifax on February 7, 1938, at the age of 93 years. Nova Scotia's oldest physician, Dr. Mack had been well and active until within a few days of his death. He was a native of Mill Village, Queens County, where he was born in 1844 and it was from his village school that he went directly to Harvard University. Here and at Bellevue Hospital Medical College he received his medical education, graduating in 1875. He first practised in Newfoundland. In 1887 he returned to his native province, moving to Bridgewater and later, Lunenburg. In 1901, after post-graduate study in London and New York, he took up his practice in Halifax, where he served for seventeen years. Retiring twenty years ago, he has since devoted himself to the care of his beautiful garden, and lived happily amongst his many friends whose highest esteem he held.

Dr. Mack was the son of Jason and Augusta (Miller) Mack of Mill Village. A brother, Hon. Jason N. Mack, President of the Legislative Council, and a sister, Mrs. John R. Creed, predeceased him by some years. Surviving are his widow, the former Miss Susan Wilson of Pictou, whom he married in 1888; and two sons, Dr. Frank G. and Frederick N. Mack, of Halifax.

Dr. Robert Patrick McLaughlin, of Ottawa, Ont., died on December 31, 1937. He was born in Cumberland, Ont., in 1867 and was a graduate of the University of Toronto (1903). Besides his widow, née Fannie McClive, Dr. McLaughlin is survived by one son, Dr. Harrison McLaughlin, of the staff of the Presbyterian Hospital, New York; two daughters, Jean and Margaret, at home.

Dr. Frank P. Patterson, of Vancouver, leader of the British Columbia Conservative Party and the official opposition in the British Columbia Legislature, died on February 10, 1938. He was born in Saint John County, N.B. in 1875, and was educated there, in British Columbia, and at McGill University (M.D., C.M., 1898) and European medical centres. He served with the Royal Canadian Army Medical Corps during the Great War. He was a Fellow of the Royal College of Surgeons, the Royal College of Surgeons(C.), and a member of other surgical and scientific bodies. He was chief surgeon of the bone and joint departments of the Vancouver General Hospital and of St. Paul's Hospital. He attended the Duke of Gloucester when the Duke broke his collarbone playing polo several years ago. He is survived by his widow; a son, Frank, studying at McGill University; and two daughters, Mrs. George White, and Dorothy, both in Vancouver.

Dr. Frank Sydney Rounthwaite, of Toronto, Ont., died on December 15, 1937. He was born in 1872 and a graduate of the Medical Faculty of Trinity University, Toronto (1895).

Dr. Charles Scott Russell, of Hamilton, Ont., died on November 5, 1937. He was born in 1888 and a graduate of Queen's University (1912).

Dr. Harold Spenceley, of Shedden, Ont., died on December 4, 1937, aged 42 years. He was born in 1895 and a graduate of Queen's University (1924).

Dr. Charles Lambert Brook Stammers, of Smith's Falls, Ont., died at the Civic Hospital, Ottawa, on January 27, 1938. He was a graduate of the Medical Faculty of Trinity University (1895).

Dr. David Stockley Sutherland, of River John, Pictou County, N.S., died suddenly in Halifax on January 26, 1938, in his thirty-eighth year. Dr. Sutherland was a graduate of Pictou Academy (1920), and Dalhousie University Medical School (1925). He had practised at Seabright and Chester. Two years ago he entered the British Colonial Medical Service in the British West Indies, returning recently to Halifax because of ill health. He is survived by his widow and two small children, by his father, mother and sisters.

Dr. Alfred Seeley Wade, of Renfrew, Ont., died on January 8, 1938. He was born in 1870 and a graduate of McGill University (1892).

News Items

Alberta

At the annual meeting of the Council of the College of Physicians and Surgeons of Alberta the former officers were re-elected: Dr. W. A. Wilson, Edmonton, *President*; Dr. W. V. Lamb, Camrose, *Vice-president*.

It was decided to submit a brief to the Rowell Royal Commission on Dominion-Provincial relations. Also discussed at this meeting was the formation of a Cancer Control Association under a plan adopted by the Canadian Medical Association under sponsorship of trustees of the King George the Fifth Cancer Fund. Members of the Council interviewed provincial health and relief branches regarding problems affecting the medical care of persons on relief and those living in the drought areas of Alberta.

The Council granted \$250 for five scholarships for the medical students of the University of Alberta, as well as \$200 towards the medical library of this Institution.

A new hospital has recently been completed at Canmore, which is considered to be the finest of its kind in the province. The erection of this edifice was made possible through the cooperation of the Canmore Coal Company and the community. The hospital is in charge of Dr. Gelfand, who has at his disposal all necessary modern surgical and x-ray equipment and up-to-date operating room facilities.

G. E. LEARMONTH

British Columbia

A new wing of the Mission Memorial Hospital was formally opened recently.

Application has been made by the hospital committee of the Board of Trade of Oliver for incorporation of the Oliver Hospital Society. Following this, application is to be made to the Provincial Government for a grant for a hospital building. A generous offer of assistance has been made by the West Summerland Municipal Hospital, which has decided to

donate x-ray equipment to the value of \$1,000, which is being replaced by a new installation.

The superintendent of the Bella Coola Hospital, Dr. J. D. Galbraith, at the annual meeting reported that the indebtedness of the hospital has been reduced from \$2,000 to about \$700. This is chiefly due to large donations from the fishermen who fished one day for the hospital benefit, and assistance from the Provincial Government and the United Church of Canada.

The rate of deaths due to cancer in British Columbia is steadily increasing and has almost doubled in fourteen years, according to statistics compiled by H. B. French and J. D. B. Scott of the provincial vital statistics branch and made public here. In an analysis of the years 1921-35 inclusive, the report shows an increase from 393 to 893 in the number of cancer deaths and from 0.74 per 1,000 of population to 1.21 in the cancer death rate. In the same period the rate of cancer deaths to all deaths has increased from 8.59 to 13.02 per cent.

According to press reports, Health Insurance was again a subject of discussion in the Provincial Legislature in December. Although Conservative members, while supporting Health Insurance in principle, moved to delete appropriations for continuing the Health Insurance Commission, since no insurance scheme was in effect, C.C.F. members, under the leadership of Dr. Lyle Telford, insisted that the vote must be passed. Dr. Telford said that Health Insurance was bound to come and the medical profession would forfeit the support of public opinion if they do not back it in principle. Dr. F. P. Patterson, leader of the opposition, expressed the favour with which the Conservative party viewed Health Insurance and stated that they were not in favour of the present Act. Criticism of the members of the Commission was made by the Liberal member from Fort George for bringing in an Act that was inoperative, and he claimed that there had been lack of tact in dealing with the medical profession. It is understood that during 1938 the government will try to work out a new health insurance program which may be inaugurated in 1939.

D. E. H. CLEVELAND

Manitoba

The annual meeting of the Sanatorium Board of Manitoba was held in the Central Tuberculosis Clinic on February 1st. The Sanatorium Board has under its administration the following hospitals—Manitoba Sanatorium at Ninette; Central Tuberculosis Clinic, Winnipeg; St. Boniface Sanatorium, St. Vital; and King George Hospital, Winnipeg.

The total number of patients under treatment at the end of December was 655. A distinctly favourable trend noted at the Manitoba Sanatorium was the decrease of far advanced cases admitted. Ten years ago 75 to 80 per cent had reached an advanced stage as compared with 50 per cent in 1937; of the remainder 42 per cent were moderately advanced and 8 per cent minimal. It is felt that surgery and semi-surgical measures are of great value. On December 31st, of a total of 274 patients in Manitoba Sanatorium 85 per cent had pulmonary disease, and the collapsing of one or both lungs was done or tried in 90 per cent of the cases. Surgical treatment had increased over the previous year by 50 per cent. From the time that chest surgery began to be done at Ninette in April, 1935, thoracoplasties have been completed on 86 people; in 91 per cent there was definite improvement, and in 70 per cent there is likelihood of permanent cure.

The x-ray department made 8,152 x-ray films at the Sanatorium, and 6,000 were done by travelling

clinics. The average film and chemical cost at the Sanatorium was 44c. and on the travelling clinics 50c. The average food cost of meals at the Sanatorium was 11.5c. per meal, in spite of considerable advance of food prices.

The Sanatorium school has proved to be very useful; 124 patients were in attendance, 90 of whom were in bed all the time, the others being ambulant and able to attend morning school. Every effort was made to encourage study by all patients physically able for it.

In the travelling clinics 6,437 examinations were made, of which 3,636 were of white people and 2,801 Indians. Tuberculosis was discovered for the first time in 125, and it is significant that only 21 per cent of the new discoveries were found to be far advanced by this method of having the doctor go to the patient. Six Indian Reserves and seven Indian Residential Schools were surveyed.

The Central Tuberculosis Registry has been set up at the Central Tuberculosis Clinic in Winnipeg. On this registry are the names and complete records of every case of tuberculosis patient and contact in the province.

At the meeting of the Medical History Club in the Medical Arts Club Rooms, February 3rd, Dr. F. G. Allison spoke on "Withering, Burke and Hare—three public benefactors".

Professor A. T. Cameron addressed the Section of Obstetrics and Gynaecology of the Winnipeg Medical Society on February 9th on "The present status of female sex hormones". There was an animated discussion.

Commissioner George Carpenter, of the Salvation Army, officiated at the opening of a new public ward, X-ray Department and Premature Ward of Grace Hospital, Winnipeg, on February 9th.

Dr. Fulton Risdon, of Toronto, addressed the regular meeting of the Winnipeg Medical Society in the Medical College at 8.00 p.m., February 10th on "Recent and old injuries of face, nose and jaws". Members of the post-graduate course in traumatic surgery were present at the meeting.

Dr. J. H. Conklin was honoured by the citizens of St. James when, on the evening of January 26th, he was presented with a physician's watch in commemoration of his retirement from the School Board of St. James. Dr. Conklin has served on the School Board for twenty-five years, the greater part of that time as Chairman.

Drs. Curry McMillan, Bernard R. Mooney and H. McMillan Edmison are now associated and are limiting their practice to radiology.

Hon. I. B. Griffiths, Minister of Health and Public Welfare, entertained at a luncheon at the Manitoba Club on January 26th in honour of Dr. J. A. Ferrell and Dr. P. W. Covington, of the Rockefeller Foundation. Other guests were Hon. S. Garson, Provincial Treasurer, Dr. F. W. Jackson, Deputy Minister of Health; Dr. E. W. Montgomery, former Minister of Health; Dr. A. J. Douglas, City Health Officer; President Sidney B. Smith of the University of Manitoba; Dean A. T. Mathers, Drs. J. A. Gunn, C. R. Gilmour, J. D. McQueen, and C. W. Burns, President of the Manitoba Medical Association; Dr. O. J. Day, President of the Winnipeg Medical Society; Professor F. D. Cadham; Drs. E. S. Moorhead and Ross Mitchell. On the previous day Dr. Ferrell and Dr. Covington met the Health officers at a luncheon in the Hudson's Bay restaurant.

ROSS MITCHELL

New Brunswick

Lieut.-Colonel R. A. Hughes, D.M.O., M.D. 7, has arranged for an extensive series of lectures by headquarters' officers, to be delivered to the medical officers of the R.C.A.M.C. in his district. These lectures will be concerned solely with the administrative side of military units. The attendance was large so far, and a great deal of interest is being shown in the series.

At the time of writing, Hon. Dr. W. F. Roberts, Minister of Health in the Provincial Government of New Brunswick, is reported to be extremely ill. Dr. Roberts underwent an operation last year and appeared to be making satisfactory progress, but has recently suffered a severe relapse.

A. S. KIRKLAND

Nova Scotia

Public Health came in for its share of attention before the Royal Commission on Dominion-Provincial relations, in session at Halifax. The brief submitted by the provincial government states, in part, "The Department of Public Health in this Province should have further moneys for the development of public health units, for more extended services in the fields of maternal and child welfare and school hygiene, and for more generous provision in relation to other matters of social welfare which, in this Province, are administered by the Department of Public Health. For these purposes no less than \$500,000 yearly is immediately required, over and above the present expenditures of this important department."

There have been only two cases of diphtheria reported in Wolfville since 1927 when the prophylactic use of diphtheria toxoid was introduced, according to Dr. C. E. A. DeWitt, Town Health Officer. The Town School Board plans on a survey of the schools with a view to introducing the tuberculin test as a routine procedure.

Dr. P. S. Campbell, Chief Health Officer, addressed the Nova Scotia branch of the Canadian Dental Hygiene Council on the importance of dental care in community welfare.

The Halifax Board of Health entered the fray between the National Fish Company and the Fish Handlers' Union, in the interests of sanitation. Strike breakers were being housed in the company's warehouses and offices during the night till the Health Board forced their withdrawal to a freighter that lay off the pier.

Idleness in the county jails was deplored by Dr. Curtis, physician to Colchester County jail, in his report to the county council. Some form of work, he felt, would improve their health and perhaps discourage some from appearing in jail so often.

Dr. J. W. T. Patton has been appointed by the Department of Pensions and National Health to examine applicants for pensions for the blind.

The need of a health unit in Cumberland County was stressed by Dr. J. W. Sutherland, in speaking before the Amherst Rotary Club.

With the appearance of a booklet recently by Dr. Hugh N. MacDonald, of Whycomagh, older residents of this Cape Breton village recalled how, in years gone, the author had become wrestling champion of North America and, on another occasion, knocked out the great John L. Sullivan. There was no mention of this in Dr. MacDonald's book devoted to the story of the two Inverness families from which he sprang,

the MacDonalds and the MacKinnons, but the tale is vouched for that the 81 year old physician, noted always for his athletic prowess, defeated Lynch, then wrestling champion of America, while a student at Queen's in 1881. It was in Boston that he met John L. Sullivan. This famous character was in his hey-day at the time and, with typical belligerence, picked a quarrel with Dr. MacDonald which resulted in his being carried from the scene.

Dr. J. C. Ballem, Medical Officer of the Pictou County Asylum, requested the consent of the Board of Commissioners to employ the insulin shock method of treatment in certain selected cases.

A chlorination plant will be installed in the Amherst water supply following reports from the local health officer and the Department of Public Health that samples of the water show the presence of *B. coli*. Until recently the water has been very pure.

Dr. F. R. Davis, speaking before the Victorian Order of Nurses at Truro, dwelt on the importance of educating the public in matters of health and advocated that greater efforts be made in teaching the importance of the periodic health examination.

The opening of a new infirmary at the Provincial Sanatorium at Kentville has been made necessary because of the great size of the waiting list. At the present time there are 287 infirmary bed patients and 32 pavilion patients and it is thought that the new infirmary will make available sanatorium treatment to many more who urgently need it.

The need of a tuberculosis annex to the Colechester County Hospital for the care of the tuberculous of the county was urged by Dr. T. R. Johnson, County Health Officer in addressing the Colchester Municipal Council.

Over 10,000 children on Cape Breton Island have been immunized against diphtheria during the past year.

Dr. H. D. Chisholm was elected health officer of Pictou and Dr. Fraser Young, jail physician by the Municipal Council.

One of the problems that is making the medical profession more and more conscious of the need of further government control in medical matters came up for discussion before the Cape Breton Municipal Council. It is found that increasing numbers of patients refuse to accept responsibility for their hospital accounts and seem inclined to regard their bills as a County problem.

ARTHUR L. MURPHY

Ontario

An announcement has appeared to the effect that the chiropractors and osteopaths of the Province of Ontario have applied in the legislature for a private Bill to amend Section 49 of the Medical Act, allowing them to use the title "Doctor". A letter has been sent out by the Ontario Medical Association to each of the affiliated Medical Societies, acquainting them with this proposal.

The Superintendent of the Fort William Sanitarium is conferring with the Department of Health in connection with a plan for the enlargement of the Sanitarium from 80 to 100 beds.

The daily newspapers announce that Toronto's Birth Control Clinic will close on March 31st, due to the withdrawal of the support of the Kitchener manu-

facturer who founded the clinic four years ago and who has financed it at a cost said to be approximately \$25,000 a year. Miss G. A. Brand, R.N., who has been in charge of the clinic since its opening, states that 25,500 birth control cases have passed through this clinic, and that in 75 per cent of these cases no payment was made. She is personally of the opinion that, for the indigent, the welfare voucher should be made acceptable for contraceptives as it is in Winnipeg. Three women physicians of the Women's College Hospital are on the staff.

Mrs. W. E. Danner, of Perth, has donated some \$30,000 to the Great War Memorial Hospital in Perth, for the erection of a new wing to accommodate 27 additional beds.

Wreckers have just completed demolishing the old building of the Women's College Hospital at 125 Rusholme Road, which was vacated when the hospital moved to its new quarters at Surrey Place.

The Ottawa Civic Hospital approved the adoption of an eight-hour day for pupil nurses. The Executive Report did not directly recommend the change but asked that provision be made for the cost in the 1938 estimates.

The City Council of London is making application to the Ontario Legislature for the passage of a Bill which will delete that clause of the Hospitals Act which sets forth that a practising medical doctor cannot be a member of a hospital board such as the Trust administering Victoria Hospital.

Dr. Fred Logan, Lindsay, recently appointed Superintendent of the Toronto General Hospital, was honoured in his home town by a testimonial banquet when citizens from all walks of life paid tribute to the work he had done during the twelve years of his practice there.

On January 19th, the Hamilton Health Association announced the receipt of a gift of \$250,000 from Mr. Charles S. Wilcox. It is proposed to build a new pavilion which will replace the last of the shacks remaining on the Mountain. It will be a sanatorium of the most advanced type.

J. H. ELLIOTT

Saskatchewan

A combined meeting of the Departments of Pathology and Pædiatrics of the Regina General Hospital was held recently when the following papers were given: "Pathology of rickets", Dr. J. C. Paterson; "Report of a case of rickets", and "Report of a case of tetany", Dr. U. Gareau; "Report of a case of peritonitis of pneumococcal origin and following appendicitis in children", Drs. F. W. Schroeder and M. A. Currie; report of "A case of vitamin B deficiency", and "Report of a case of acrodynia", Dr. L. Brown.

Dr. A. C. MacMillan was elected president of the medical staff of the Grey Nuns' hospital for 1938. Other officials elected were: *Vice-president*, Dr. M. A. Currie; *Sec.-treasurer*, Dr. D. C. McRae; *Executive Members*, Drs. H. M. Graham, L. Roy and H. Spooner.

Dr. L. M. Hanna has been appointed Assistant Medical Health Officer for the city of Regina. Dr. Hanna graduated from Queen's in 1919 and has practised in Brownlee, Sask., for the past eighteen years. Medical relief care will be confined to Dr. Hanna and his staff and general public health work to Dr. George R. Walton.

LILLIAN A. CHASE

General

The Great Lakes Sectional Meeting of the American College of Surgeons, including Ontario, Quebec, and the states of New York, Ohio, Michigan, and Pennsylvania, will be held in Toronto, Ont., March 22nd to 24th. The headquarters will be at the Royal York Hotel. A most active Committee on Local Arrangements, headed by Dr. W. E. Gallie, is making excellent plans for this meeting. The program will consist of clinics, scientific sessions, hospital conferences, medical motion pictures, and other features. A visiting group of ten or twelve outstanding surgeons will participate.

Tuesday, March 22nd.—Registration and general information for Fellows of the College, hospital representatives, and guests; operative and non-operative clinics, surgery and the surgical specialties, local hospitals; hospital conference; medical motion pictures: (1) general surgery, (2) eye, ear, nose and throat surgery; annual meeting, Fellows of the College; medical motion pictures, general surgery; scientific meeting, general surgery; medical motion pictures, eye, ear, nose and throat surgery; hospital conferences.

Wednesday, March 23rd.—Registration and general information for Fellows of the College, hospital representatives, and guests; operative and non-operative clinics, surgery and the surgical specialties, local hospitals; hospital conference; medical motion pictures, general surgery; scientific meeting, general surgery; scientific meeting, eye surgery; scientific meeting, ear, nose and throat surgery; hospital conference; medical motion pictures, general surgery; scientific meeting, general surgery; scientific meeting, eye surgery; scientific meeting, ear, nose and throat surgery; motion pictures for hospital representatives.

Thursday, March 24th.—Registration and general information for Fellows of the College, hospital representatives, and guests; fracture clinic; operative clinics, eye, ear, nose and throat surgery; hospital conference; scientific meeting (panel round table conference), eye surgery; scientific meeting (panel round table conference), ear, nose and throat surgery; cancer clinic; hospital conference; medical motion pictures, general surgery; community health meeting.

This meeting will be of interest not only to Fellows of the College but to the medical profession at large, as well as to hospital trustees, superintendents, nurses, and hospital personnel. There is no registration fee.

The American Association of Obstetricians, Gynecologists and Abdominal Surgeons—Foundation Prize.

—(1) The award which shall be known as "The Foundation Prize" shall consist of \$500.00. (2) Eligible contestants shall include only (a) interns, residents, or graduate students in obstetrics, gynecology or abdominal surgery, and (b) physicians (with an M.D. degree) who are actively practising or teaching obstetrics, gynecology or abdominal surgery. (3) Manuscripts must be presented under a nom-de-plume, which shall in no way indicate the author's identity, to the Secretary of the Association together with a sealed envelope bearing the nom-de-plume and containing a card showing the name and address of the contestant. (4) Manuscripts must be limited to 5,000 words and must be typewritten in double-spacing on one side of the sheet. Ample margins should be provided. Illustrations should be limited to such as are required for a clear exposition of the thesis. (5) The successful thesis shall become the property of the Association, but this provision shall in no way interfere with publication of the communication in the journal of the author's choice. Unsuccessful contributions will be returned promptly to their authors. (6) All manuscripts entered in a given year must be in the hands of the Secretary before June 1st. (7) The award will be made at the annual meetings of the Association, at which time the successful contestant must appear in person to present his contribution

as a part of the regular scientific program, in conformity with the rules of the Association. The successful contestant must meet all expenses incident to this presentation. (8) The President of the Association shall annually appoint a Committee on Award, which, under its own regulations shall determine the successful contestant and shall inform the Secretary of his name and address at least two weeks before the annual meeting. Jas. R. Bloss, M.D., Secretary, 418 Eleventh Street, Huntington, W. Va.

Archives Internationales des Brucelloses.—The social danger arising every day from human and animal brucellosis has made urgent the creation of a review which will centralize the various studies on this subject, which have been pursued hitherto without a well defined plan. It was voted at the International Congress of Avignon to establish the *Archives Internationales des Brucelloses* whereby it is hoped that the results of the research work published therein will interest the world at large. The first number is expected to be out on January 1, 1938.

All interested should communicate with Dr. Jos. Jullien, Managing Editor of the *Archives Internationales des Brucelloses*, Joyeuse (Ardèche), France.

Osler Scholarship.—This scholarship, which has a value of \$975.00, is awarded by the Canadian Medical Association every third year to a candidate nominated by the Faculty of Medicine, McGill University, in order that such candidate may pursue special studies to advance the knowledge of medicine and to improve the teaching of clinical medicine. Applications, addressed to the Dean of the Faculty of Medicine, will be received up to, and including, March 31, 1938.

The conditions attached to the scholarship shall be: (1) The candidate must be a graduate of not more than ten years' standing and, other things being equal, preference shall be given to a graduate of McGill University; (2) he must have shown definite promise of achievement; (3) he must submit a specific program of study, which must be approved by the Committee appointed by the Faculty. Further information may be obtained from the Dean or Associate Dean, Faculty of Medicine, McGill University.

Book Reviews

Treatment of Diabetes Mellitus. E. P. Joslin. 6th ed., 707 pp., \$7.00. Lea & Febiger, Phila., 1937.

This book needs no introduction. A new edition, however, is not a reprint, and the contents show that the fifth edition has been thoroughly revised with the addition of much valuable material which has appreciably increased its size.

There is one chapter only which, in the opinion of the reviewer, mars the general standard set by this authoritative work on diabetes. This deals with his experiences and those of others with different mixtures of protamine, zinc and insulin. Protamine zinc insulin is now a standard product; for a given number of units of insulin it contains a definite quantity of zinc and a definite quantity of protamine. The results obtained with this product, therefore, are in some instances not even approximately comparable with those of earlier mixtures. This chapter is, therefore, more likely to confuse than enlighten, since the earlier and more recent experiences are not clearly defined; protamine insulin and protamine zinc insulin are, for example, discussed as though the products are identical. In fact, the author states that, in general, throughout the book, when the words protamine insulin are used they refer to protamine zinc



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insulin. The following is taken verbatim as an example: "Today the general practitioner can start his patient upon diet and (PI) at the first visit, confident that reactions will not result during the following twenty-four hours. By return visits, daily, then every other day, later two times a week, and soon once a week, once in two weeks, and eventually once a month or even less often, he can easily, safely and efficiently treat his case, and at the same time avoid prolonged single sances for instruction which rob him of his time and overwhelm the patient with what he does not know. PZI par excellence is the family-doctor's type of insulin." It is obvious, therefore, that, except for the statement of the fact that in the treatment of diabetes there is now available a more effective form of insulin, this chapter serves no purpose. Aside from this one chapter, however, as with previous editions, no medical library in the English language can be said to be complete without this authoritative work.

Heart Failure. A. M. Fishberg, M.D. 771 pp., illust., \$8.50. Lea & Febiger, Phila., 1937.

This is not just another book. It is, as its title implies, a book on failure of the heart and of the circulation, with the two as one entity. The theme of the book is cardiac and vascular dynamics. It is not a new approach. Harrison in his "Failure of the Circulation" discusses the various problems from a similar point of view and his classification of hyperkinetic, hypokinetic, and dyskinetic syndromes is accepted and further developed in the author's division of failure into hyposystolic and hypodiastolic types of cardiac failure and failure of the peripheral circulation. This division into types is carried throughout the book and applied specifically to the effects of the various types of structural change and to the explanation of clinical signs and phenomena. The importance and practicability of venous pressure, observations and estimations, are a feature throughout.

The first few chapters are given to the physiology and the pathological physiology of the circulation. This is possibly the most valuable part of the book. It has the clinical viewpoint and a number of practical methods of measuring various functions of the circulation are clearly described. The next few chapters deal with the various types of dyspnoea and then cyanosis, oedema, and pulmonary engorgement. The chapter on gallop rhythm is good. The portion dealing with peripheral failure—shock—vies with the first portion of the book in interest and importance. Treatment occupies the final section and while the principles there are pretty well orthodox they too are derived from previous discussion and follow logically.

The book is written in textbook fashion and the style is clear. The limits of present day knowledge in this field are well defined. The author exhibits a wide familiarity with the literature, and the bibliography is quite full. It is stated in the preface that the work is for the general practitioner, but most decidedly it has an important place on the shelves of the internist as well.

Diseases of the Ear, Throat and Nose. J. D. McLaggan, M.A., M.B., F.R.C.S.(Eng. and Edin.). 338 pp., illust., 15 s. H. K. Lewis, London, 1937.

This work is one of the General Practice Series. The preface states that it is an attempt to teach the principles of ear, throat and nose work. Within the limitations of a volume of this size it has fulfilled its purpose admirably, and the busy general practitioner will find it very useful for quick reference. The descriptions of surgical operations cannot of necessity be given in detail but will give the practitioner an intelligent understanding of the problems involved. One would like to see more attention given to the management of hæmorrhage, the bugbear of this field of medicine.

The Principles and Practice of Rectal Surgery. W. B. Gabriel, M.S., F.R.C.S. 2nd ed., 353 pp., illust., 28s. H. K. Lewis, London, 1937.

This second edition of "The Principles and Practice of Rectal Surgery" by Mr. Gabriel is presented five years after the publication of his first edition, and is a detailed record of the experience and progress in the diagnosis of rectal ailments and the practice of this branch of surgery, which the author has collected since 1920. The whole field of rectal surgery is covered in a most thorough manner. The volume is noted particularly for the newer work on surgical anatomy contributed in collaboration with Mr. O. V. Lloyd-Davies. Mr. Gabriel has made the timely observation that a certain percentage of fistulæ-in-ano eventually become malignant. In the new material one notes: the rôle of epidermophytosis in pruritus ani; injuries of the rectum; lymphogranuloma inguinale, and many new refinements of technique and post-operative care. The chapters on benign and malignant tumours of the terminal bowel are thoroughly and extremely well written. Mr. Gabriel's perineo-abdominal operation for cancer of the rectum presents itself as one of the most important features of the book.

Pediatric Urology. M. F. Campbell, M.S., M.D., F.A.C.S. Vol. 1, 576 pp.; vol. 2, 540 pp., illust., \$15.00 per set. Macmillan Co., New York, 1937.

To the urologist, no group of specialists appears to be more urologically minded than the pædiatrists. It is, therefore, fitting that these two attractive volumes should be devoted to the consideration of urological problems in the young. In them, disturbances of the urinary tract occur only too frequently, and it is unfortunate that many having the responsibility of the care of the young are unaware of this fact, and are equally ignorant of the fact that the urologist is provided with an armamentarium capable of carrying out urological studies in the most youthful subjects, with a facility as complete and adequate as in those of a maturer age. This work undoubtedly should be of great value in focussing the attention of the medical profession at large upon this point. The work is of equal importance to pædiatrist and urologist because of the important statistical studies of urological conditions in infants and children, which, in view of the author's unusual opportunities, are almost unique.

In the very young anomalies of the genito-urinary tract play a most important rôle in the production of urinary lesions, and Dr. Campbell has devoted 212 pages to the consideration of this aspect of urology in children. As indicated above, he has had an unusual access to a wealth of clinical and pathological material. Of this material he has made good use, as may be seen in the resultant statistical studies.

The volumes are printed on good paper and are well and copiously illustrated. The bibliography at the end of each chapter is worthy of a special commendation by the reviewer. To anyone who has to do with the care and treatment of the young, the volumes can be warmly recommended.

Pathology of the Central Nervous System. C. B. Courville, M.D. 344 pp., illust., \$5.75. Pacific Press Publishing Assn., Mountain View, Calif., 1937.

This broad survey of neuropathology as it applies to the problems of the surgeon, physician, otologist, obstetrician, and pædiatrician makes readily available a wealth of neuropathological data. The incidence of the various lesions has been compiled on the basis of 15,000 autopsies from a general hospital. The range of subject matter is wide and emphasis is laid constantly upon the pathogenesis of disease of the central nervous system. The treatment of brain abscess is



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particularly happy in this regard. There is but little space devoted to the relationship of pathological processes to signs and symptoms. A chapter devoted to the cerebrospinal fluid has not been included, and its varying responses during life to pathological processes of the central nervous system have not been stressed. Deficiency diseases are disposed of rather briefly.

This work appeals to the reviewer as a suitable book of reference for student and practitioner, providing as it does a foundation for consideration of clinical problems together with many indispensable key references.

Protoformotherapy in Treatment and Prevention. N. E. Ischlondsky. 227 pp., illust., 21s. Henry Kimpton, London, 1937.

The author has given the name "Protoformative Incret" to an extract prepared in accord with the most recent technique from embryo corresponding to the period of greatest biological activity, which he claims takes place at the end of the third or beginning of the fourth month in the human being. Experimental work was carried on with guinea-pigs, but since 1929 intramuscular injections of the incret have been given to about 1,200 human patients. This has been prepared in two extracts, one containing that of all body tissues with the exception of the recognized endocrine glands, and the other that of the entire body. He hypothesizes a cellular life in which all cells of a species have hormonal activity with later development of specific hormones for specialized organs. There is a claim of priority in concept and in experiment in reference to the most recent thesis on internal secretory hormones, antihormones pro-hormones and activators. He accepts the physiological activities of the pituitary gland as a most prominent governing rôle.

The results from his clinical work, and that of his collaborators, are truly surprising. They have been carefully classified. If the clinical results can be duplicated and substantiated and the increts prepared in sufficient amounts our present concepts of prevention and treatment of disease will undergo a change for the better. His work is indeed broad in its biological conception of life processes. Every physician who uses endocrine extracts should read this book; it is stimulating; it is critical; and it is constructive.

Biological and Clinical Chemistry. M. Steel, Ph.D. 770 pp., illust., \$8.00. Lea & Febiger, Phila., 1937.

"In the present text the author has attempted to blend theoretical and practical biochemistry and biophysics with chemical pathology and clinico-chemical methods". To this excerpt from the preface it may be added that this book covers the fields of both biochemistry and pathological chemistry, as known in several of our own universities, and includes instructions for laboratory work interspersed with the theoretical treatment of these subjects. The subject-matter of the book is extensive and supplemented with adequate references; the subject-form of the book is open to criticism. For example, vitamins and hormones are treated in both their academic and pathological aspects in Chapters XI and XII, and nutrition and normal protein metabolism not till Chapters XVIII and XXI respectively.

The dialectical relationship of theory and practice, of lectures and laboratory, is recognized by all teachers in the sciences, but is met in different ways. Through a keen desire, no doubt, to keep the experimental evidence before the too speculative mind, Professor Steel has attempted to include his practice with his theory. More strictly he has given us a mixture of theory and theory of practice: for reading about an experiment can never be the same thing as doing it, or, conversely, the reading of textbooks is not a usual part of laboratory work. Detailed directions for

experiments are distracting to the mind on a definite train of thought. The incorporation of experimental evidence in the theoretical treatment of a subject is quite a different matter from the addition of details—often requiring quite different theory—as to how that experimental evidence is attained. Thus, in the reviewer's opinion, this book would have been better without its experiments, although these appear to be well enough chosen and adequately described. The book contains much up-to-date and accurate information, and will be found useful by both students and medical practitioners.

Clinical Chemistry in Practical Medicine. C. P. Stewart, M.Sc. and O. M. Dunlop, B.A., M.D., F.R.C.P.E. 2nd ed., 372 pp., \$3.00. Macmillan, Toronto, 1937.

The authors' aim was to treat adequately but concisely the everyday problems requiring chemical investigation. The value as well as the limitations of these investigations are clearly pointed out and the authors wisely emphasize the fact that the results of biochemical investigations must always be considered in conjunction with those of clinical examination, and that taken alone can rarely, if ever, justify a diagnosis.

This second addition is somewhat revised. Some tests have been wisely omitted, others advantageously added. It should prove of value to the practitioner and student.

The Cerebrospinal Fluid. H. H. Merritt and F. Fremont-Smith. 333 pp., illust., \$6.00. McAinsh & Co., Toronto, 1937.

Only in the last decade has it been possible to evaluate with any degree of certainty the diagnostic significance of completely examined cerebrospinal fluid. Such progress has resulted from careful correlation of cerebrospinal fluid studies with detailed clinical case records and verified diagnoses. Merritt and Fremont-Smith, through their long association with the Cerebrospinal Fluid Laboratory of the Boston City Hospital, have contributed much toward this advance. In this book they have made a thorough analysis of over 21,000 fluids, to show how this examination can be used in the differential diagnosis of disease. The chemistry and pathological physiology of cerebrospinal fluids are considered in moderate detail, and the routine methods of testing briefly clearly set forth. The technique of lumbar and of cistern puncture are carefully considered. The greater and most valuable part of the book deals with the cerebrospinal fluid syndromes in every condition in which such an examination might conceivably be used. In each syndrome the possible variation in the pressure, appearance, cell count, and chemical nature of the fluid is concisely presented, followed as a rule by a discussion of the differential diagnosis. In many conditions the authors present the changing pattern as the case progresses, and show the effect of treatment upon the spinal fluid. A chapter is included on the methods of roentgenography of the ventriculo-subarachnoid space, more particularly on encephalography. This is informative but too restricted in scope, as well as insufficiently illustrated, to be of practical value, and might well have been left out. Not only as a comprehensive reference book but as a very practical handy guide this text should be of great value to pathologists, technicians, and neurologists, as well as to anyone whose clinical work entails a frequent consideration of the cerebrospinal fluid.

Short Years, the Life and Letters of John Bruce MacCallum, M.D., 1876-1906. A. Malloch. 343 pp., \$3.50. Normandie House, Chicago, 1938.

Damn the tubercle bacillus! Osler wrote of the subject of this fine memoir that he was "one of the most brilliant young men it has ever been my lot to

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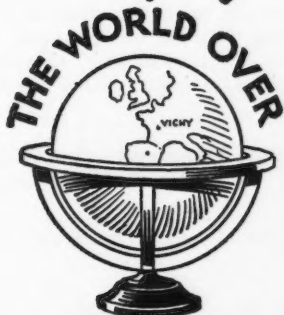
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teach. . . Alas! he succumbed suddenly, to the irreparable loss of science in America. He had a mind of singular acuteness, a clear judgment, and he had caught from Mall some measure of that investigating spirit that has made the anatomical school of John Hopkins University so famous. When the news reached me of his death, one morning as I sat at breakfast, I broke down in an irresistible paroxysm of regret and had to leave the table"—one of the few occasions when Osler's *æquanimitas* failed him.

Son of the versatile Dr. G. A. MacCallum, of Dunnville and London, Ont., J. B., like his elder brother, W. G., the pathologist, was one of the large group of distinguished research workers, pupils of Ramsay Wright, which the University of Toronto contributed to Johns Hopkins in the '90's. During his short years at Baltimore and in California, under Loeb, where he bravely fought a losing fight against tuberculosis, he did pioneer work of permanent value on the embryology and histology of the heart muscle and the intestines, and on the action of calcium and the salines. His letters give an introspective picture of his student days, his work, his summers in Muskoka, his travels—to Germany, Jamaica, Denver (where he practised briefly) and California, and in addition they have a literary, romantic, and psychological interest. He was also an artist, musician, story-writer, and poet; and the few poems included make one wish that room had been found for more. The "Spirit of Death", when he conjured it, answered only too promptly:

Oh come, be swift and take me while I stand,
My work still grows beneath a steady hand,
A life that ne'er grew old!

As might be expected of the distinguished Canadian librarian of the New York Academy of Medicine, Dr. Malloch has skilfully handled his abundant material. It is that best kind of work, a labour of love, for MacCallum was a hero to him in his boyhood. The book is finely printed.

Monograph on Veins. K. J. Franklin, D.M., M.R.C.P. 410 pp., illust., \$6.00. C. C. Thomas, Springfield, Ill., 1937.

The author introduces the following quotation from a letter by J. S. Haldane, "Physiology may be compared to a house partly built, partly building, and partly being re-built". In no respect is this more applicable than as regards our knowledge of the circulatory system, and, probably, one detail which has suffered neglect more than any other is the venous circulation. The present work reviews and enlarges our knowledge of the veins with unusual and welcome comprehensiveness. Nowhere else is so much brought together on this branch of physiology.

It is however much more than a mere collection of facts. Physiology is fully discussed. The chapter on the function of venous valves, for example, is most enlightening, not the least interesting part being the uncertainty that still exists regarding some aspects of their function. Chapters on embryology and comparative anatomy complete a full and valuable contribution to the physiology of the veins.

Twenty-five Years of Health Progress. L. I. Dublin, Ph.D. and A. J. Lotka, D.Sc. 611 pp. Metropolitan Life Insurance Co., New York, 1937.

This comprehensive study is a veritable mine of information regarding what has happened during the course of a quarter of a century among the policyholders of the Industrial Department of the Metropolitan Life Insurance Company. As this group has proved to be representative of the country as a whole, the happenings, as recorded, may be interpreted in a national way.

The painstaking work of Doctors Dublin and Lotka is deserving of the highest praise, and the

clearness of their exposition of the statistical material makes the volume readily understandable by the person with not too statistical a mind. Through this publication the Metropolitan Life Insurance Company has added to the many worth-while contributions it has made in the field of Public Health.

Russian Medicine. W. H. Gantt, M.D. Clio Medica Series No. 20, 214 pp., illust., \$2.50. P. B. Hoeber, New York, 1937.

This is volume 20 of the Clio Medica series of primers of the History of Medicine. Dr. Gantt is well qualified for the task of compiling a history of Russian medicine, having served on the American Relief Administration in 1922-23 and later having worked for five years under the late Professor Pavlov. In 1935 he again visited Russia, and was thus able to observe the Soviet phase at different stages of development. He finds that medicine was much later in developing in Russia than in Central and Western European countries. While medical schools and hospitals staffed by foreign doctors were established during the reign of Peter the Great, it was not until the 19th century that independent Russian medicine came into being, associated with such names as Pirogov, Pavlov, Mechnikov and Botkin. The chapter on famines and epidemics makes gruesome reading. Dr. Gantt's observations during his different visits to Soviet Russia have led him to believe that "a completely regenerated Russia is arising from the ruins of the old". While his review of Soviet medicine is necessarily brief, it would appear to be a well-balanced one and will be read with interest. Of Soviet achievements he mentions the marked reduction of the death rate and infant mortality rate, the control of such epidemic diseases as small-pox, typhoid and cholera, the great increase in the number of hospitals, sanatoria and rest homes, and the vast campaign in health education. He noted on his last visit that the attitude of the medical profession in Russia is now almost entirely favourable to the new system of socialized medicine.

Physical Signs in Clinical Surgery. H. Bailey, F.R.C.S.(Eng.). 6th ed., 284 pp., illust., \$6.25. Macmillan Co., Toronto, 1937.

This book is always up to date. One will look for a long time amongst books on physical signs before finding one with such carefully chosen and beautifully reproduced illustrations. They really do teach.

Minor Maladies and their Treatment. L. Williams, M.D. 7th ed., 439 pp., \$3.00. Macmillan Co., Toronto, 1937.

There are many useful hints on treatment in this book.

The Development of the Vertebrate Skull. G. R. de Beer, M.A., D.Sc., F.L.S. 552 pp., illust., \$9.50. McAlinsh, Toronto, 1937.

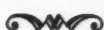
Anyone who has ever attempted even in a general way to compare the skull of man with that of lower mammals or reptiles and to determine the morphology of the different parts will realize the thorny and difficult field into which this book ventures. And it enters this field in no casual way but to a depth of 515 closely printed pages with abundant simple and clear illustrations.

The book is divided into three parts. The first deals with some general questions of the nature of cartilage and bone and goes on to review Goethe's theory that the skull is made up of several fused vertebrae. This theory of course has not stood the test of time but out of it arose the recognition of the segmental structure of the posterior end of the skull.

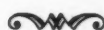
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In a large proportion, estimated at well over fifty per cent, of all cases of lobar pneumonia, the causative agent is a Type I or a Type II pneumococcus. In treatment of pneumonia caused by either of these types of the pneumococcus, favourable results from serum therapy had become, by 1934, so obvious that international units were then adopted for standardization of Type I and of Type II anti-pneumococcus sera.

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The second part, constituting the main bulk of the book, consists of a detailed and comprehensive account of our present knowledge on both the chondrocranium and the adult skull in every group of vertebrates. Not many living men are competent to pass judgment on the great mass of facts which are collected here, and the reviewer cannot claim to possess the knowledge necessary for this task. In fact, time alone will reveal the merits or the failings of the work. That it represents a great amount of painstaking labour and that it will materially assist future workers in this field are obvious.

The third, and for general reading the most interesting, part of the book deals with various problems arising out of a comparison of the chondrocrania in different forms and the homologues of various parts in both the chondrocrania and bony skulls. The author discusses the relative merits of cartilage and bone as materials for a scaffold supporting and protecting the brain, and shows that in the early embryonic stages when the brain is growing rapidly cartilage possesses a great advantage in its power of rapid interstitial growth which enables it to function efficiently and grow rapidly at the same time. The embryonic chondrocranium of higher forms is itself a functioning structure and has evolved along its own lines; it cannot be regarded as merely an ancestral type of adult skull which has been pressed back into the embryonic stage of development in later forms. And this independent evolution of the chondrocranium makes it very unsafe as a basis for phylogenetic arguments along the lines of the recapitulation theory. The book ends with a list of queries and problems awaiting solution.

In producing a work of this magnitude and scope it is almost impossible to avoid some errors and misprints, but it was a rather unfortunate slip that the table on page 364 states that the human basioccipital and basisphenoid unite in the 18th month after birth.

Diseases of the Skin. Late R. W. MacKenna, M.A., M.D., B.Ch. 4th ed. revised by R. M. B. MacKenna, M.A., M.D., M.R.C.P. 557 pp., illust., \$6.00. Macmillan, Toronto, 1937.

Although in this edition the book has been enlarged by more than 50 pages and contains 46 coloured plates in addition to many excellent black and white illustrations, the price has been reduced to six dollars. As in the former edition all the common diseases of the skin are adequately dealt with and a number of useful prescriptions given. A chapter on the atrophies has not been included, and although most of them can be found in other parts of the book, it would be more convenient if they were grouped together.

Primary Carcinoma of the Lung. E. J. Simons, M.D. 263 pp., illust., \$5.00. Year Book Publishers, Chicago, 1937.

Primary carcinoma of the lung is a disease which has increased both absolutely and relatively in recent years, until its incidence, estimated at 2 per cent in the first decade of this century, has now reached 10 per cent of all cancers. According to some studies it would seem that 12 to 15 per cent of all cancers are now cancer of the lung.

The author is a physician in general practice in a small town whose interest in the subject was aroused through a case arising in his own practice. He has made a survey of the literature of pulmonary cancer, has presented a summary of the important contributions, and gives a balanced summary of his conclusions in the fields of incidence and etiology. Written by a general practitioner for the man in general practice he discusses at length the clinical features of the disease, the symptomatology, physical findings, diagnostic methods and differential diagnosis, while treatment is as fully discussed, the surgical section having been reviewed before publication by Evarts Graham.

The physician will find that it summarizes all he should know about the subject; the pathologist will find it an excellent help in his gross and microscopic study of sputum, pleural fluid and tissue; the radiologist and bronchoscopist, a guide to diagnosis as well as treatment; while the surgeon will probably find much that will be of help in the discussion of methods of diagnosis and in the application of surgery in those cases amenable to operation. Most important is the emphasis placed upon the early symptoms of the disease. It is a timely monograph, embracing every phase of a subject of steadily increasing importance.

BOOKS RECEIVED

International Clinics. Edited by L. Hamman, M.D. Vol. 4, forty-seventh series, 343 pp., illust., \$3.00. J. B. Lippincott, Montreal, 1937.

The Doctor's Bill. H. Cabot. 313 pp., \$3.00. Columbia University Press, New York, 1935.

Cancer the Great Darkness. By the Editors of *Fortune*. 80 pp., \$1.00. Doubleday, Doran & Co., Toronto, 1937.

The Patient and the Weather. W. F. Petersen, M.D. Vol. 4, part 3. Organic Disease—Surgical Problems. 651 pp., \$10.00. Edwards Bros., Ann Arbor, Mich., 1938.

Materia Medica for Nurses. A. M. Crawford, M.D., F.R.F.P.S.G. 4th ed., 106 pp., 3s. 6d. H. K. Lewis, London, 1937.

Obstetric and Gynaecologic Nursing. H. Fa'ls, M.S., F.A.C.S. and J. R. McLaughlin, B.A., R.N. 492 pp., illust., \$3.50. MacAinsh, Toronto, 1937.

Diabetic Manual. E. P. Joslin, M.D. 6th ed., 219 pp., illust., \$2.00. Lea & Febiger, Phila., 1937.

Yoga, a Scientific Evaluation. K. T. Behannan, Ph.D. 270 pp., \$2.75. Macmillan Co., Toronto, 1937.

The Baby's First Two Years. R. M. Smith, A.B., M.D., Sc.D. 4th ed., 121 pp., \$1.75. Houghton Mifflin Co., Boston, 1937.

First Aid to the Injured and Sick. Edited by F. C. Nichols, M.C., M.B., Ch.B., M.R.C.S., L.R.C.P., L.D.S. 16th ed., 318 pp., \$0.75. Macmillan, Toronto, 1937.

Man, Bread and Destiny. C. C. Furnas, Associate Professor of Chemical Engineering, Yale University, and S. M. Furnas. 364 pp., \$3.00. Williams & Wilkins, Baltimore, 1937.

Massage and Remedial Exercises. N. M. Tidy. 3rd ed., 455 pp., illust., \$4.50. Macmillan, Toronto, 1937.

Surgeon's Pocket Book. H. S. Souttar, D.M., M.Ch., F.R.C.S. 2nd ed., 285 pp., \$2.25. Macmillan Co., Toronto, 1937.

Third Report of the Wellcome Research Laboratories at Gordon Memorial College, Khartoum. A. Balfour, M.D., B.Sc., F.R.C.P., D.P.H. 477 pp., illust. Baillière, Tindall & Cox, London, 1938.

Handbook of Accepted Remedies. Edited by P. J. Hanzlik, M.D. 2nd ed., 115 pp., \$1.00. J. W. Stacey, San Francisco, 1937.

Mentality and Homosexuality. S. Kahn, B.S., M.A., Ph.D., M.D. 249 pp., \$3.00. Meador Publishing Co., Boston, 1937.